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METHODS AND STANDARDS FOR LOCAL SCHOOL SURVEYS

BY

DON C. BLISS

SUPERINTENDENT OF SCHOOLS
MONTCLAIR, NEW JERSEY

WITH INTRODUCTION

BY

GEORGE DRAYTON STRAYER

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To my Wife

ACKNOWLEDGMENT

In the preparation of the material in this book, constant use has been made of the reports of surveys conducted by groups of experts in different cities. If there is failure in adequate acknowledgment of borrowed material, it is due to oversight and not to any intention of utilizing the labors of others in an unauthorized manner.

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INTRODUCTION

EFFICIENCY in any line of human endeavor depends upon our ability to evaluate the results which are secured. No one would question that progress has been made in education during the past hundred years, but one may very justly inquire what measure of efficiency has been secured from the money spent and from the effort and devotion of those engaged in teaching. In mercantile pursuits it has been noted that seven out of every ten failures can be charged directly to a lack of knowledge of facts. Such an investigation as we have had in education tends to prove that a like situation is to be found in this field. The failures in education, whether arising from a lack of economical use of funds, from an inefficient system of organization, or from an unintelligent practice in method, are, on the whole, not to be charged to an absence of devotion on the part of those who have given their lives to the schools, but until it is possible to measure the results achieved, the cause, and the degree, of the failures cannot be established.

It is undeniable that real progress is made by the process of trial and error, both in the art of teaching and in the practice of administration. That we shall have to depend in considerable measure upon demonstration as a means of bringing about improvement in current educational practice must also be admitted,

but it is none the less true that scientific work in education will furnish the basis for the more rapid elimination of mistakes and will point the way to improved organization of teaching. The science of education will, in its development, occupy the same relative position to teaching that the science of medicine occupies to the art of healing. The progress of the past twenty-five years in farming would never have been possible without the scientific work which has been done in agriculture.

Aside from the fact that we are only beginning to have a profession of education, many other elements have delayed progress in standardizing our work through accurate measurement of the results achieved. One of the most comforting of the fallacies which are sometimes brought forward to oppose the attempt to measure results is the popular belief that the only criterion for judging school work is the ultimate success of the individuals who have been subjected to it. The most inefficient teacher, in the most poorly equipped school, if his period of service has been long enough can point to the success of a few boys who once attended that particular school as proof of the adequacy of the work which is now being done. The failures are never brought to mind. To select a group of individuals who, because of native ability and favorable environment which has no direct relation to the school, achieve distinction, and to claim that their success is due to our system of education, may be satisfying to our pride but cannot appeal to our judgment. The only available measure of the work done in any school is the change brought about in boys and girls, young men

and young women, during the period of their school life.

It has been claimed, also, that the most precious element of education cannot be measured. Those who advance this argument speak vaguely in terms of "atmosphere", "spirit", and the like. Two replies may be made to this contention. One is that any power which the teacher has, whether it is called influence or ability to teach arithmetic, must produce some change in the children who are taught. Another, equally valid, answer is the fact that the best teachers of arithmetic, literature, geography, history, or other studies, are, at the same time, the teachers whose influence in the school we value most.

We have been hopeful that the sciences of biology, sociology, and economics would eventually solve the problems of education. That the work done in these fields is essential to the development of a scientific standard in education cannot be questioned, and no one is fully equipped to undertake investigation in the latter field without preliminary training in these fundamental sciences. Nevertheless, except for the fact that such competent investigators have attacked the problems directly rather than through the work of the biologist, psychologist, sociologist, or economist, our progress must have been slow indeed.

Many who are unacquainted with modern statistical methods as applied in the social sciences have felt that it was impossible to measure large groups of individuals who differ in ability, in interest, and in environment. It may be confidently asserted, however, that the measurement of a large group is more satisfactory

than the attempt to measure a single individual. With regard to ability in school subjects we can be more sure of the accuracy of our results in comparing two groups, of a thousand each, than we could in the attempt to measure accurately two individual children.

A very persistent objection to the measuring of results comes from those who feel that it is unfair to compare individuals or groups existing under different conditions. They would claim, for example, that we cannot compare children in spelling ability when one group comes from homes in which the English language is spoken, while the other hears only a foreign language at home. This objection is probably due to a belief that the measurement will disregard the growth or development which has characterized the groups. In reality, if we measure achievements in spelling, the attempt is to determine the changes which have been brought about in any group, in terms of units which are comparable. If group one shows ability ten, having advanced during the year from ability seven, its progress will be considered just as satisfactory as that made by group two, which has moved from ability eight to ability eleven. In other words, the purpose of measurement is never to impose an arbitrary uniformity. It is, rather, to discover differences and the reason for their existence, and, most of all, to give us some adequate means of estimating progress or change.

Let us suppose, again, in a matter of business administration, that one school shows a much higher per capita cost than another. This does not prove that one school is more efficiently managed than the other. What it does do is to suggest that some adequate reason

be found for the difference which exists. In like manner, one city may show a much higher cost for janitors' salaries than does another. This stimulates investigation, but it does not prove that the city with the higher cost is inefficiently managed or is extravagant in its expenditures. It may be that the one which spends a relatively large amount for janitorial service actually gets more per dollar for its money than does the one with the smaller cost. It is always the purpose of measurement to discover discrepancies and to raise problems.

On the ground that the scientific study of education is significant only in so far as it has to do with a careful investigation of the processes involved in growth, it has been contended that the derivation of scales or units of measurement is unnecessary. Those who make this contention seem to feel that a thorough study of the way in which children form habits and grow in power of reasoning or ability to appreciate will determine absolutely the methods to be employed in teaching. The difficulty with this point of view is that human beings, even though they be trained in investigation, are fallible. The only final test of the success of any method, however carefully derived from a knowledge of the processes involved in growth in a particular aspect of mental life, is the result achieved. Theoretically a method may seem perfect, and yet in terms of the results secured it may prove to be a failure. Thus, the accurate measurement of results gives us our only certainty that we have chosen the right method for bringing about any particular type of mental growth or development.

Possibly the one element which, more than any other, has retarded the movement to secure accurate measurement of results is the tendency in education to appeal to authority and the corresponding lack of devotion to scientific inquiry. To accept the opinion of those who have had experience in the field is, of course, much the easiest way to meet a problem, and no one would deny the value of the judgment of our great educational leaders, but these very men would be the last to place their own opinions in opposition to the results obtained from a scientific study. Indeed, it is in no small measure due to their insistence that we are beginning to have adequate investigations of our educational practice.

In administration there has already been a really effective study of costs both with regard to the relation of expenditure for education to other expenditures, and to the question of the proper distribution of state school funds. We may hope for much more significant work in this field as more adequate systems of accounting are introduced and more satisfactory reports are issued. It is noteworthy that in those school systems where an attempt has been made to study the expenditures remarkable savings have been made. In many lines we have not yet determined what is the lowest limit of expenditure consistent with the maintenance of our present efficiency. Much work has been done on problems of organization of schools, and yet the question of retardation and elimination will be satisfactorily treated only as we secure more accurate records of attendance, scholarship, health, promotions, and demotions. These are becoming available from the statistics now kept in our more progressive

school systems. The problems of departmental work and individual instruction can never be solved until we measure accurately what is secured under different systems of organization.

Superintendent Bliss has given us in this book a manual which will be of very great help to the superintendent of schools who wishes to attack his problems in a scientific manner. He has brought together from his own practice and from the field of school surveys and investigations in educational administration, the methods which can be most satisfactorily employed in checking up the work of a school system. He has dealt with the problems of attendance, classification and progress of children, with the financing of the school system, with the necessity for a building program, with the technique of measuring the achievements of pupils, and many other questions which are continually before the superintendent for solution. Throughout the book he has presented the case just as the superintendent of schools has to meet it from day to day. The method of attacking each of the problems has been described with such directness and simplicity as to make it available even for those who have had little special training in administration.

When those who are responsible for the administration of public education determine their policies and alter their practices in the light of such precise and complete knowledge as can be had by following the methods proposed in this book, we may confidently claim that the scientific attitude has prevailed. Those who support our schools by the payment of taxes are beginning to insist that we reach those standards of

efficiency which are becoming common in commercial and industrial pursuits. Scientific management is as necessary for those who would be efficient in educational administration as is skill in the art of teaching for those who would instruct children.

GEORGE DRAYTON STRAYER

METHODS AND STANDARDS
FOR
LOCAL SCHOOL SURVEYS

CHAPTER I
INTRODUCTORY

CRITICISM of his most cherished institutions is regarded by the average American citizen as an inalienable right, and the severity of his arraignment is usually proportionate to his interest in the object of his censure. No institution receives sharper criticism from its supporters than the public schools, in spite of the fact that the American people are thoroughly committed to the public school idea and the passage of years has only served to increase its hold upon the country. It would seem that this devotion to the educational ideal in America is so complete that nothing short of perfection is acceptable, and every decade witnesses departures from the beaten track, which sometimes prove to be mere fads, but in most cases must be construed as honest attempts to find a more effective method of educational procedure.

Among recent developments in education none bears greater evidence of a real desire to know and remedy defects than does the so-called school survey, conducted by a group of professional educators and practical school men. The theory has been that this impartial body of

investigators can, by visiting schools and applying certain well recognized standards, determine the relative efficiency of any school system. Even a superficial examination of the reports of the various school surveys shows that this assumption contains a certain measure of truth, although the limitations under which such a group of experts must work are obvious. The activities of a school are so varied and the results are so subtle that the brief time usually allotted to the investigation fails to reveal the effects of many of the local school conditions which are perhaps of supreme importance.

The general educational sentiment of a community cannot be determined by a cursory inspection, and no superficial examination can show whether the school department receives the moral support of its constituency. The professional attitude of the teachers, the altruistic spirit in which they devote themselves to their work, and the extent to which they coöperate with the school officials can be known only after a long and intimate connection with the schools. It is possible for very experienced school men to be deceived by surface indications, since teachers, for reasons of prudence, are careful to say little of their personal attitude toward those with whom they are associated. So important are these facts, and so vital to an adequate understanding of conditions, that a new superintendent in a city with a population of no more than twenty or thirty thousand should devote a large part of his first year to familiarizing himself with his local environment. If this is true of a small community, it applies with even greater force to the larger city, and the keenest *spectator ab extra* can scarcely hope to cover the ground thoroughly in a few weeks.

Another factor militating against the efficacy of a general survey is the pride which a community inevitably has in its own school system. Readers of the report made by the investigating staff are prone to feel that the defects of the local schools have been magnified and many of their virtues overlooked. This condition is greatly exaggerated when the survey is instituted by one faction in a deliberate attempt to discredit another. Too often, surveys have originated in a desire on the part of the school board to secure such information as will justify them in the eyes of the community for the dismissal of the superintendent. Under these conditions the friends of the accused official naturally rally to his support, and the effects of the resulting contest persist long after its actual causes are forgotten. School efficiency is peculiarly dependent upon the spirit which permeates the system, and only as a last resort should the friends of the schools begin a controversy which is sure to result in more or less injury to the children. The pages of current educational literature bear ample testimony to the injurious effects of school surveys inaugurated for the purpose of verifying *a priori* opinions.

Without question the principle of school surveys is fundamentally sound. The school superintendent, busied with the details of administration, tends to lose the proper perspective of his work, and long-continued contact with inefficiency and indifference develop a mental astigmatism which it would seem must be corrected by the judgment of a person less habituated to the presence of such weaknesses; but strong as these tendencies are, they need not operate to prevent a clear understanding of the local situation. Given a superintendent with an ade-

quate professional training, alert to the recent developments of educational theory and practice, in touch with conditions in the most progressive school systems, and resolved to bring his own schools to a high level of efficiency, it is reasonable to assume that he can do all that could be accomplished by any board of experts, and in addition, because of his familiarity with his schools, can obtain results impossible to the most impartial body of investigators. Freed from the opposition of those who are unwilling to recognize the existence of facts derogatory to the local schools, he is in a position to conduct an inquiry which will reveal actual conditions. Having discovered the facts, the superintendent can formulate a policy to correct existing faults and, with the exercise of reasonable tact, secure the coöperation of teachers and public in carrying out his plans.

Such a method as this avoids the undesirable publicity which accompanies the work of an imported board of professional experts and leaves the way clear for the accomplishment of necessary and desired reforms. This, after all, is the chief consideration. It is of little value to discover weaknesses unless steps are taken to remedy them. We have reached the point in our educational philosophy where we must apply to our theory the test of accomplishment. We measure a man in terms of achievement; to require of the schools the same ability to produce results is only logical and reasonable.

One difficulty in the way of a campaign for self-improvement based upon the facts shown by self-analysis, is lack of sufficient records of professional experience in this field so collated as to furnish available standards for the superintendent's use. It is true that current

educational literature contains reports of investigations and studies by progressive school men, but, isolated as they are, they do not provide a definite chart for the would-be local surveyor.

If this book helps to give an impetus to local studies, its purpose is served. It is the result of several years of experience in the study of local school conditions. So far as practicable, illustrations are drawn from specific towns and cities because of the conviction that records of concrete situations are more suggestive than a presentation made in general terms. Reports of various important surveys and those undertaken by superintendents of schools for their own communities, as well as the different studies made by the writer, have been drawn upon freely for the comparative statistics presented. In stating the results of standard tests employed, the actual method of giving the tests is omitted, since these directions are now available for general distribution.

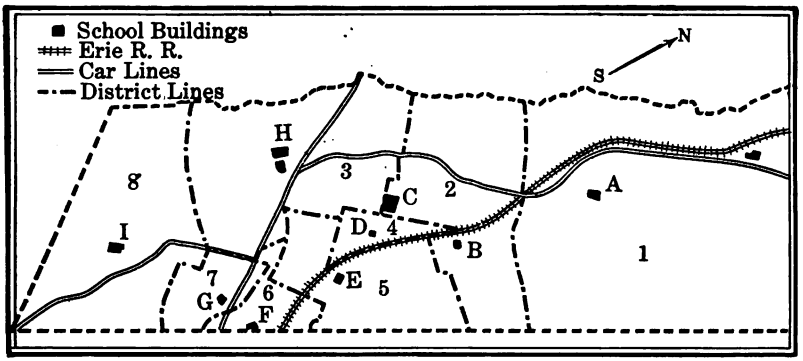
CHAPTER II

GENERAL CONDITIONS

THE first requirement in the consideration of any question is the setting of the problem. As a preliminary to the study of the details of any school system it will be of material assistance to construct an outline map of the city, showing the areas of the school districts, the location of the school buildings, and the grades they are designed to accommodate. Transportation facilities should be included as a pertinent factor. A map of this character shows whether the buildings are so placed as to serve their respective districts advantageously and indicates, in a general way, the probable future enrollment of the schools. It may reveal mistakes in the previous selection of school sites and furnish convincing evidence that wisdom demands restricting the size of certain buildings to their present capacity and providing for future growth by means of a second building in a more strategic location.

The map at the top of the following page, showing an area of approximately 5.7 square miles, represents conditions in a town of 25,000 inhabitants, and the location of its nine school buildings.

Transportation facilities of a reasonably adequate character are afforded by the trolley line extending approximately north and south the entire length of the



Districts numbered from 1 to 8.

A — Junior High School and Elementary School Center.
C — Senior and Junior High School Center.
H — Junior High School and Elementary School Center.
B, *D*, *E*, *F*, *G*, and *I* — Elementary School Centers.

town. Three junior high schools, located in the north, center, and south central sections, provide for all pupils in grades seven to nine. These are fed from elementary schools and in turn send their pupils to the senior high school at the geographical center of the town. Such an arrangement of buildings frees primary children from the necessity of walking unreasonable distances and at the same time furnishes the concentration of older pupils which is essential to a plan of organization involving a differentiated course of study.

The district in the northern end of the town is at present sparsely settled, making it necessary to require many pupils to travel comparatively long distances. As the population becomes more congested, a primary school will be erected in the northeastern section of the district. This will be limited to the first six grades, with direct promotion to the present school at *A*. District 2 is

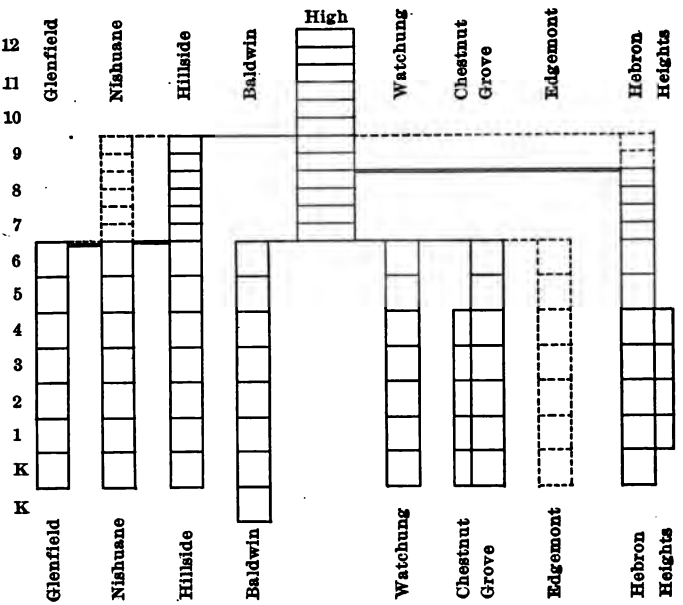
now served by a single primary building at *B*. Comparatively few pupils come from the western section of this district, but, with the certain growth in population, a second primary school will be located on the opposite side of the trolley line. Future building plans contemplate the development of an additional junior high school at *I*, which will serve that section adequately. District 6 is the Italian section and is the most crowded of all. The impossibility of securing a site near the center forced the location of the school on the extreme eastern boundary. Such a location is generally unwise, but in this instance the small size of the district makes it less objectionable than would otherwise be the case.

Summarizing this detailed statement, we find three distinct types of schools in the scheme of organization: (*a*) Elementary, including grades I–VI; (*b*) Junior High School, grades VII–IX; (*c*) Senior High School, grades X–XII. The buildings are so placed that small children are cared for in their immediate district. Promotion is made to the junior schools, where large numbers are essential to the effective organization of the departmental teaching with differentiated courses of study. These intermediate schools are well distributed to serve the different sections of the town.

The general plan of organization is represented graphically in the accompanying chart. The diagram shows the relations of the various centers to each other.

The location of the different schools makes it possible to group in the respective buildings comparatively distinct types of children, and because of this homogeneous character of the classes the needs of each group can be effectively met. Obviously a group of Italians or negroes

whose education, because of economic conditions at home, is limited to the compulsory school period, needs a curriculum sharply differentiated from that for a group of



PLAN OF ORGANIZATION.

Dotted lines — Prospective Conditions.
Double lines — Temporary Conditions.
Solid, Single, and Double lines — Present Conditions.
Single and Dotted lines — Ultimate Conditions.

children from homes of wealth, who are likely to continue their studies in colleges or professional schools. In only one building, *H*, are the different types mingled to any considerable extent.

The general character of the problem to be solved in any community is indicated by the following table.

POPULATION, CENSUS OF 1910

City	Population	Native Born Native Parents	Native Born Foreign Parents	Foreign Born	Negroes
Pasadena, Cal.....	30,291	62.8%	19.4%	14.2%	2.5%
Topeka, Kan.....	43,684	63.6	16.4	9.5	10.4
Des Moines, Iowa....	86,368	62.3	22.3	12	3.4
Montclair, N.J.....	21,550	42	23	24	11
Brookline, Mass.....	27,792	41.8	27.3	30	.8
Newton, Mass.....	39.806	40.9	29.7	28.1	1.2
Yonkers, N.Y.....	79,803	27.1	37.5	33.3	1.9
E. Orange, N.J.....	34,371	53.1	24.7	16.5	5.5

The extent to which the public school is fulfilling its mission to educate all of the children of the community is indicated roughly by the ratio between population and school attendance. The United States census returns, which are carefully supervised and are presumably accurate for any community, provide statistics for 1910 giving the distribution of population in each town or city

SCHOOL ATTENDANCE, ALL AGES, 1910

City	Population	School Population	Per Cent
Albany, N.Y.....	100,235	16,023	16
Chester, Pa.....	38,537	5,979	15.5
Elizabeth, N.J.....	73,409	12,774	17.4
Hartford, Conn.....	98,915	18,951	19.2
Malden, Mass.....	44,404	8,983	20.2
Montclair, N.J.....	21,550	3,758	17.4
New Britain, Conn....	43,916	8,465	19.3
Newton, Mass.....	39,806	8,427	21.2
Salem, Mass.....	43,697	8,588	19.6
York, Pa.....	44,750	7,529	16.8

within the following age limits: under six years, six to nine years inclusive, ten to fourteen years inclusive, fifteen to seventeen years inclusive, and eighteen to

twenty years inclusive, and also the percentage of the population from these classes attending school. Ten representative cities are selected as a basis for comparison.

Even more significant is the question of the actual attendance of children within the compulsory school age, in its relation to the number of children of the same age living in the given community.

The following table indicates the comparative percentage of children 6–14 years actually in school and the total number of children of the indicated age living in the city.

ATTENDANCE DATA, CHILDREN 6–14

City	1910 Total Pop.	Pop. 6–14	Pop. 6–14 in School	Per Cent (2) of (1)	Per Cent (3) of (1)
Albany, N.Y.	100,253	13,380	11,824	13.3	11.8
Chester, Pa.	38,537	5,942	4,954	15.4	12.8
Elizabeth, N.J.	73,409	12,182	10,597	16.6	14.4
Hartford, Conn.	98,915	14,673	13,957	14.8	14
Malden, Mass.	44,404	7,484	6,918	16.8	15.6
Montclair, N.J.	21,550	3,078	2,795	14.3	13
New Britain, Conn.	43,916	7,085	6,626	16.1	15.2
Newton, Mass.	39,806	6,001	5,743	15.1	14.4
Salem, Mass.	43,697	7,007	6,581	16	15.1
York, Pa.	44,750	7,047	6,247	15.7	13.9
Totals and Percentages.	549,237	83,879	76,242	15.4	14.09

It occasionally happens that the character of the population in a city leads to the assumption that the variation in school attendance is due to the indifference of foreign born parents to the opportunities for an education offered by the schools. Such an inference is not justified by the facts, as in many instances these people are more eager to secure an education for their children than are native born Americans.

CHAPTER III

ORGANIZATION AND ADMINISTRATION

A STUDY of the published reports of the surveys made in different sections of the country shows clearly that the organization of many school systems prevents efficient administration. While the superintendent is nominally the head of the system, in actual practice many of his functions are assumed by committees of the Board of Education. As a consequence, responsibility is divided and valuable time is wasted in making adjustments on a personal basis. The situation is further complicated by the creation of a business department entirely separate from the superintendent and charged with the care of the buildings and the purchase of school supplies. As an inevitable result, this department assumes the decision of many questions materially affecting the educational interests of the schools.

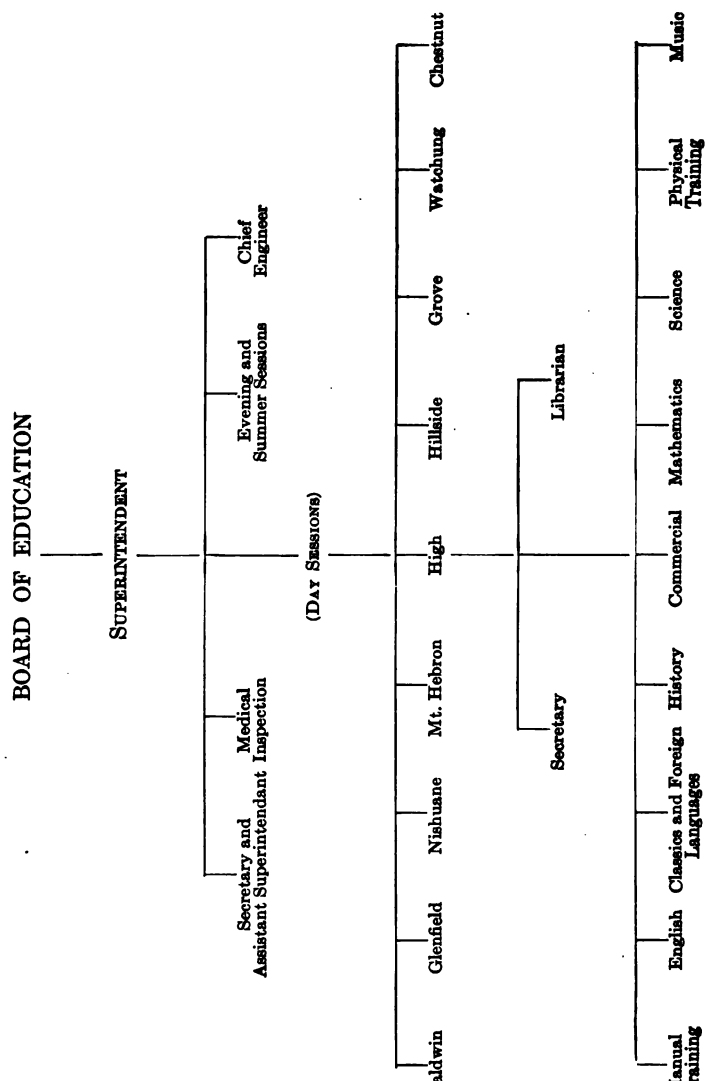
Such a plan as this is wrong in principle. Schools are maintained for the sake of educating children and not for the sake of transacting business. The division of authority, with a consequent waste of energy and loss of efficiency, may be obviated by making the superintendent the real head of the system in fact as well as in name. Authority and responsibility must be commensurate.

Such a concentration of power in the hands of the superintendent does not mean that the Board of Education

will have nothing to do. Since they represent the public, the Board of Education must play a conspicuous part in all questions of fundamental school policy, such as decisions respecting the type of education the schools are to furnish, the amount of money to be appropriated for maintenance, the location of school buildings and the character of their construction; but the outlining of courses of study, the choice of textbooks, decisions relative to competency of instruction, the selection and assignment of teachers and janitors are matters of expert judgment, and any attempt at Board direction of these problems is certain to result in confusion and in positive detriment to school efficiency.

It is foolish to pay good salaries to professional experts and then refuse to accept their judgment. An illustration of this pernicious policy occurred recently in an eastern city. The Board were impressed with the value of pupil self-government, and, contrary to the advice of superintendent and principal, directed that the responsibility for the government of all study halls in the high school should be immediately intrusted to the pupils themselves. As no preparatory training for this responsibility was given, a state of chaos arose and it required several months of strenuous effort on the part of the teachers and principal to eliminate the results of this ill-advised action.

A community is truly fortunate when the Board is made up of men who, being accustomed to the direction of large enterprises, recognize the need of applying the principles of good corporation organization to the educational affairs of the town. Such men assume the position of a board of directors for a large corporation, giving the


BOARD OF EDUCATION
SUPERINTENDENT
Secretary and Assistant Superintendant
Medical Inspection
Evening and Summer Sessions
Chief Engineer
(DAY SESSIONS)
Baldwin
Glenfield
Nishuane
Mt. Hebron
High
Hillside
Grove
Watchung
Chestnut
Secretary
Librarian
Manual Training
English
Classics and Foreign Languages
History
Commercial
Mathematics
Science
Physical Training
Music

executive officers of the school authority similar to that vested by corporations in their presidents and managers. This is as it should be. So long as the schools prosper and their management is reasonably economical, there is no just cause to interfere with details. When these conditions cease to exist, the obvious remedy is a change in administrative officers, and not an attempt to assume their duties.

The principles outlined above appear in the preceding graphic illustration.

During the last two decades there has been a tendency in city school organization to create small Boards of Education, limited to five or seven members, none of whom is *ex officio*. A Board of this size, elected from the city at large, or appointed by the mayor or the city commission, provides an effective working body. Experience has proved that such a Board is in every way more satisfactory than the Boards of from ten to forty-six members, occasionally found. The real work of a large Board is usually done by a small group of half a dozen men, while the energies of the other members are directed to the formation of cliques and factions which tend seriously to embarrass the school department.

In his admirable book on *School Administration*, Dr. Cubberley gives the following table of the frequency of size of school boards throughout the country, as found in fifty cities of the United States, with a population of over 100,000 inhabitants in 1910.

An important factor in the administration of any enterprise is continuity of policy. This is secured by a Board of five members having a five-year term of office and so appointed that each year brings a possible change of only

one member. A desirable feature of the organization of so small a Board is the elimination of all standing committees. Thus every question of importance receives the consideration of the entire membership, and as a direct consequence of this policy the executive officers assume the mass of routine and detailed work which properly belongs to them and leave the Board free to devote its attention

Size of Board	Number of Cities
0	1
3	1
4	1
5	15
6	1
7	8
9	10
12	3
14	2
15	3
18	1
21	1
30	1
33	1
46	1

to a discussion of those larger policies of administration which are essential to a wise development of the school system.

Another direct result of the scheme of organization outlined above is the recognition of the principle of a unit rather than a dual plan of school administration. The responsibility for the entire management of the business and educational interests of the schools is vested in a superintendent on whose recommendation is appointed an assistant superintendent who is in entire sympathy

with the general policies prevailing in the schools. The assistant may be also the regularly appointed secretary of the Board of Education. An harmonious administration of the schools is thus secured, in strong contrast to the conflicts of authority inseparable from the dual organization prevalent in many cities. In actual practice, large discretion is left to the assistant superintendent, who is charged primarily with the conduct of the business affairs of the schools. Requisitions for supplies, routine repairs, and similar questions are determined on his own authority. Only in the event of a difference of opinion between him and other persons in the force would the matter be referred to the superintendent for final settlement. By this plan so much lost motion is eliminated that the assistant superintendent has time for many questions of a purely professional character.

Economy of time is further effected by the policy of the Board with respect to small expenditures. The superintendent's office is authorized to pay bills not exceeding $100 without referring them to the Board of Education for prior action. As these expenditures are reported in detail at the semi-monthly meetings of the Board, there is no danger of extravagance.

The principles which form the basis of organization of the central office are carried into the respective schools. The principal is recognized as the head of his building, specifically charged with responsibility for its general care as well as for the discipline of the pupils and the character of the teaching in the classrooms. Teachers are encouraged to exercise initiative and independence, the ultimate consideration being the welfare of the pupils.

Such a plan as this has one grave danger: the creation

of separate schools with such a diversity of ideals as to impair the unity of purpose essential to a well-rounded school system. This can be prevented only by careful oversight from the central office. At monthly cabinet meetings, attended by principals and supervisors, policies are discussed and general plans outlined. A frank and full expression of opinion is sought; ultra-radical ideas are modified by the criticism of associates, and the final policy is one to which all can subscribe.

CHAPTER IV

THE SUPERVISORY AND TEACHING STAFF

A SCHOOL system is successful in so far as it brings out the best service the teachers can give, and leadership on the part of supervisors is a fundamental requirement in securing this most desirable result.

Unless the number of supervisors is adequate, however, their entire energies will be absorbed in the routine work of their respective departments, and no time will remain for the intensive study of school problems and the formulation of constructive plans. Boards of Education desiring to restrict expenditures frequently pursue a penny wise policy in this respect which no large business firm would tolerate. "Brains at the top" is one of the wisest possible investments, and in the long run is the cheapest.

Supervision to be of true value must develop along lines of educational leadership. The narrow conception which limits it to duties of inspection and reporting, forces it to stifle growth instead of acting as a stimulant to personal initiative on the part of the classroom teachers. Habits of constant reading and study, with resultant progress along professional lines, are essential to a supervisor, and so important is this attitude of mind that the value of any supervisory official to a school system can almost be determined by the extent to which he is giving

himself to the study of some original problem connected with his particular department.

It is entirely possible to obtain definite information regarding the ratio between the number of supervisory officers and pupils. The following data are given in the report of the United States Commissioner of Education for 1912–1913:

NUMBER OF PUPILS IN AVERAGE DAILY ATTENDANCE FOR EACH SUPERVISORY OFFICER

Western Cities	Pupils per Supervisor	Eastern Cities	Pupils per Supervisor
Colorado Springs, Col.	208	Trenton, N.J.	182
Sacramento, Cal.	252	Troy, N.Y.	227
Pasadena, Cal.	262	New Bedford, Mass.	269
San Diego, Cal.	283	Des Moines, Iowa	291
Butte, Montana	296	Youngstown, Ohio	341
Ogden, Utah	312	Grand Rapids, Mich.	359
Tacoma, Wash.	331	Kansas City, Mo.	360
Los Angeles, Cal.	333	Camden, N.J.	371
San Jose, Cal.	365	Albany, N.Y.	372
Spokane, Wash.	369	Duluth, Minn.	381
San Francisco, Cal.	397	Omaha, Neb.	400
Seattle, Wash.	400	Yonkers, N.Y.	445
Denver, Colo.	423	Dayton, Ohio	446
Berkeley, Cal.	433	Springfield, Mass.	464
Oakland, Cal.	445	Lowell, Mass.	479
Salt Lake City, Utah	460		
Portland, Oregon	513		
Average	358	Average	359
Median	365	Median	371

In *Public School Administration*, Dr. Cubberley gives the distribution of the supervisory force in the various positions, grouping them according to the size of the cities.

ENROLLMENT AND SUPERVISION

Size of Cities	No. of Cities	Average No. Sup'ts. and Ass'ts.	Average No. Supervisors	Average No. Teachers	Average No. Pupils Enrolled
Over 100,000	50	8.0	16.5	1517	62,589
25,000 to 100,000	183	1.2−	4.8+	203	7,442
10,000 to 25,000	374	1.1−	2.8−	74	2,679
5,000 to 10,000	632	1.0+	1.5−	38	1,380

The relative number of pupils, supervisors, and teachers for a group of small school systems in New Jersey in 1916 furnishes a standard for a superintendent in a community of corresponding type.

ENROLLMENT AND SUPERVISION IN NEW JERSEY

Town	Enrollment	Ratio of Supervisors to Teachers[1]	Ratio of Supervisors to Enrollment
Belleville	2847	12.9	475
Bloomfield	3933	16.9	492
East Orange	7564	11.3	378
Irvington	4225	13.0	528
Montclair	4772	12	262
Nutley	1967	14.0	492
Orange	5366	11.1	383
South Orange	1804	9.0	258
West Orange	2699	16.8	540
Median	3933	12.9	475

Critics often point to the comparatively small proportion of men engaged in educational work and predict dire results from the feminization of the schools. The same group of New Jersey towns is used to show the relative proportion of men and women employed as teachers.

[1] Includes the superintendent and non-teaching principals.

RELATIVE NUMBER OF MEN AND WOMEN EMPLOYED

Town	Men Teachers	Women Teachers	Ratio Women to Men
Belleville	7	76	10.9
Bloomfield	26	117	4.5
East Orange	30	215	7.2
Irvington	11	101	9.2
Montclair	36	169	4.7
Nutley	10	50	5
Orange	28	141	5
South Orange	10	60	6
West Orange	9	75	8.3

A typical organization in a city of 27,000 inhabitants with an enrollment of 5000 pupils is:

1 Superintendent
1 Secretary to Superintendent
1 Primary Supervisor
8 Non-teaching Principals
1 Industrial Arts Supervisor
9 Teaching assistants
1 Supervisor of Physical Training
6 Teaching assistants
1 Music Supervisor
1 Penmanship Supervisor
38 Senior High School teachers
30 Junior High School teachers
85 Elementary teachers
19 Kindergarten teachers
7 Building clerks and substitute teachers
2 Medical Inspectors
2 School Nurses
1 Attendance Officer and School Nurse

Office Force

1 Bookkeeper
2 Stenographers and general clerks

Mechanical Department

1 Head Engineer in charge of buildings
1 Carpenter
1 Carpenter and Painter
1 Electrician

The superintendent, in addition to college training, should have postgraduate work in education in some university. The primary supervisors likewise should have had courses along special lines in addition to the preliminary training in the college or normal school. A reasonable number of the junior high school positions should be filled with college trained teachers for the sake of the broad outlook afforded by such study, and in so far as funds permit, men should be secured for some of these positions. The ideal would be to have approximately one-half of the teachers men, but as a rule the salaries paid in the seventh and eighth grades will not be adequate to retain good men for any length of time. Nevertheless, the disadvantage resulting from a change of teachers may be accepted for the sake of a man's influence with adolescent boys and girls.

No principle of school administration is more thoroughly established than the wisdom of recruiting the majority of the teaching force from sources of supply other than the local community. Tax-payers are prone to feel that salaried positions should go to local candidates, and pressure from influential citizens to secure this result is often difficult to withstand. If the home candidate's ability is equal or superior to that of the applicant from another town, there is no valid reason for refusing to make some concession to this demand, but the pernicious results of excessive inbreeding are too well known to allow its adoption as a general policy. The number of local teachers to be employed must be determined by existing circumstances, and no hard and fast rule can be formulated. In some instances salary schedules are too low to attract good teachers from other school systems. Such a con-

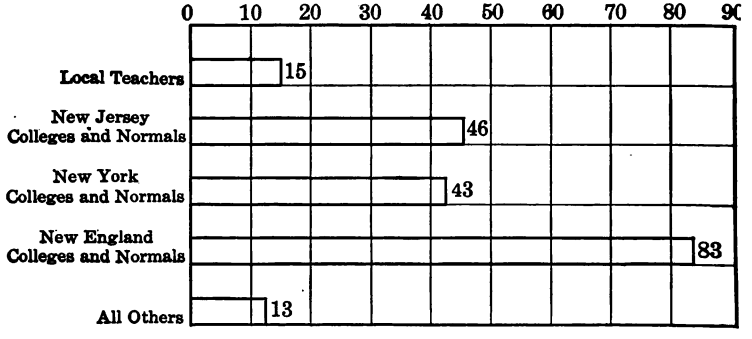
dition makes it wise to offer appointments to local teachers of proved worth, especially to those who have secured some experience elsewhere. The principle, however, is clear: viz., so far as possible to fill vacancies by the appointment of teachers who can bring with them a view-point other than that obtained by training in the local schools.

The following table gives the training of teachers in a New Jersey community where the principles indicated have been applied.

PROFESSIONAL PREPARATION

	Principals	Supervisors	Elementary Teachers	High School	Total
College Training.....	3	4	16	34	57
Normal Training.....	3	0	106	3	112
Other Institutions.....	0	4	18	0	22
High School.....	2	0	5	2	9

In this group the different localities and institutions represented are so varied as to exercise a mutual restraint on the tendency of any one type of training to predominate. A graphic representation of this fact follows.



RELATION OF LOCAL TEACHERS TO TOTAL NUMBER

The constantly changing *personnel* of the teaching force is a serious detriment to efficiency. Because it takes time to learn the conditions peculiar to any system, even the best of teachers needs a year's association with the school before she can exercise her full powers. The principal and supervisors cannot use her services to the best advantage until they know her intimately. If a teacher is alert to her opportunities for helpfulness and is genuinely progressive, her capacity to do efficient work should increase steadily for years, and school officials cannot escape the penalty of retrogression in their schools if they allow such teachers to resign to accept better positions.

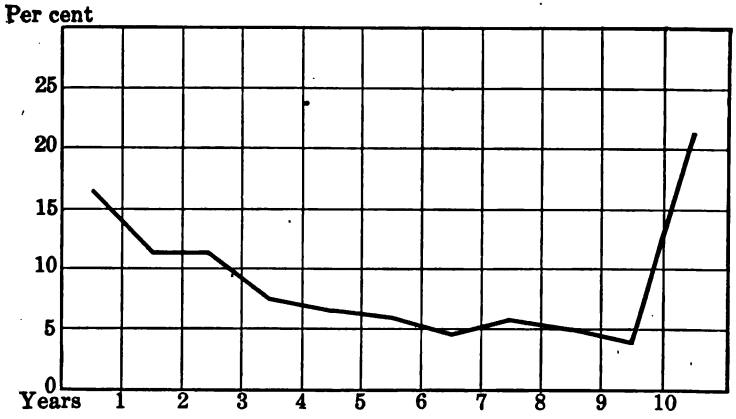
The school system represented in the following table is failing to secure from its teachers the benefits that come from length of service.

TENURE OF SERVICE

Years	Number Teachers	Per Cent
Over 10	43	21.5
10	7	3.5
9	10	5
8	12	6
7	9	4.5
6	12	6
5	13	6.5
4	15	7.5
3	23	11.5
2	23	11.5
1	33	16.5
	200	100

The facts are shown graphically on the chart at the top of the next page.

TIME OF SERVICE IN PER CENTS



Similar statistics appear in the various survey reports.

YEARS OF TEACHING EXPERIENCE

	0–4	5–9	10–14	15–19	Over 20
Plainfield, N.J.....	42%	30%	11%	8%	9%
East Orange, N.J.....	48	33	8	5	6
Newark, N.J.....	29	23	18	13	17
Passaic, N.J.....	52	17	15	10	6
Butte, Montana.....	44	37	19		
Salt Lake City.....	50	21	17	6	6

Dr. Strayer and Dr. Thorndike, in *Educational Administration*, give the median experience for men in the high school as eight years and for women six years.

Any comparison of length of service for a given community must not fail to take into consideration the element of growth in the schools. Obviously the city that is growing rapidly, and therefore increasing its teaching force, must increase to a corresponding degree the percentage of teachers with the shorter period of service.

CHAPTER V

SALARIES

THAT salaries and length of service are closely related is an obvious fact. Teachers, as a rule, are not working primarily for salaries, but they must live, and they consequently tend to accept positions in those communities which offer the highest tangible rewards. School conditions in large cities like New York or Chicago do not appeal to them; they prefer the larger freedom possible in the smaller communities. For this reason the smaller towns do not find it necessary to meet the salary schedule of the large city. They must, however, pay as much as others of their own class or there is no escape from the tendency of the best and most progressive teachers to drift to the communities in which the compensation is greatest.

A teacher has a right to expect a salary which will enable her to secure a comfortable room and good food, and to dress in a manner in keeping with her position in the community. It should also provide her with funds for books and recreation, summer maintenance, and leave a margin for old age and unexpected contingencies. Constant financial worry is a serious handicap to a teacher's ability to give her best service.

The exact salary required to meet the essential minimum must of necessity vary with local conditions. A number of extensive studies of this important question have recently been published, several of which are here reproduced.

SALARIES IN THIRTY-THREE CITIES, 1915 [1]

	KIND.		I–VI		VII–VIII		HIGH SCHOOL				
							WOMEN		MEN		
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Night School per Night
Ardmore, Pa.	...	900	...	900	600	900					
Atlantic City, N.J.	600	900	600	900	600	1000	850	1200	1000	1800	
Auburn, N.Y.	400	600	400	600	600	800	700	1000	1000	1500	$2.00–$3.00
Bayonne, N.J.	600	1000	600	1000	600	1000	700	1300	1000	1800	2.50– 3.00
Beverley, Mass.	...	....	400	700	500	700	600	1000	800	1600	2.00– 5.00
Bloomfield, N.J.	...	725	800	850	...	900	900	1200	1000	1350	1.75– 2.50
Bridgeport, Conn.	500	750	500	800	550	860	700	1100	800	1650	1.50– 3.00
Brockton, Mass.	...	....	550	700	550	700	700	1200	1000	1700	2.00– 3.00
East Orange, N.J.	650	900	650	950	750	1100	800	1500	1500	2700	
Elizabeth, N.J.	600	800	450	750	600	850	700	1000	800	1400	2.50– 3.00
Everett, Mass.	...	....	450	900	450	900	500	900	900	1500	1.50– 3.50
Greenwich, Conn.	500	900	500	900	500	900	800	1100	900	1600	2.00
Holyoke, Mass.	400	650	450	700	475	800	700	1000	800	1500	1.50– 3.00
Kingston, N.Y.	...	....	500	650	500	650	700	900	750	1000	
Meriden, Conn.	480	720	480	720	480	720	600	950	....	....	1.50– 2.00
Montclair, N.J.	500	875	600	1000	700	1200	800	1200	1200	2250	1.50– 3.00
New Brunswick, N.J.	600	750	550	750	550	750					
New London, Conn.	...	500	400	675	500	800	....	....	....	....	1.50– 3.50
New Rochelle, N.Y.	600	1050	600	1050	600	1050	950	1450	950	1400	2.50– 3.50
Northampton, Mass.	...	440	...	580	650	650	....	850	....	1300	1.50
Paterson, N.J.	475	850	475	900	475	1000	700	1200	1000	1800	2.00– 3.00
Perth Amboy, N.J.	500	950	500	950	500	950	700	1300	900	1800	2.50– 3.00
Plainfield, N.J.	600	1000	600	1000	600	1100	700	1400	1000	2000	2.00
Port Chester, N.Y.	600	900	600	900	...	950	1000				
Poughkeepsie, N.Y.	500	600	500	600	500	600					
Quincy, Mass.	...	....	...	....	...	....	700	1000	800	1800	
Schenectady, N.Y.	500	750	500	750	500	800	700	1800	1000	1800	2.00– 2.50
Somerville, Mass.	300	650	375	750	375	750	650	1200	1000	2000	1.50– 4.00
So. Manchester, Conn.	400	750	400	640	400	640	....	....	....	....	1.50– 2.50
Waterbury, Conn.	450	800	450	850	450	800	700	1300	750	1900	
West Hoboken, N.J.	550	1200	550	1200	550	1200	1100	1800	1100	1200	2.00
White Plains, N.Y.	650	900	650	900	750	1000	900	1200	1200	1800	1.50– 2.00
Yonkers, N.Y.	600	900	600	1000	700	1200	900	1700	1200	2200	

[1] From an unpublished study made by S. J. Slawson, Bridgeport, Conn.

	ALLOWANCE ABSENCE			SPECIAL TEACHERS						Janitor's
	Personal Illness	Family Illness	Special	Music	Drawing	Writing	Physical Training	Domestic Science	Manual Training	Salary Average
Ardmore, Pa.	Full	.....	4 days	1100	1000	....	1000	1050	1600	....
Atlantic City, N.J.	3 days	½ pay	20 "	...	...	...	....	...	...	576
Auburn, N.Y.	10 "	.....	3 "	1300	900	900	900	900	1500	846
Bayonne, N.J.	15 "	½ "	5 "	1500	1500	1500	....	1500	1600	....
Beverly, Mass.	5 "	.....	5 "	1050	950	1000	....	750	1500	700
Bloomfield, N.J.	2 "	2 days	2 "	1250	1100	850	950	1050	1450	750
Bridgeport, Conn.	20 "	.....	4 "	1200	1200	1400	1500	600	1100	761
Brockton, Mass.	20 "	Less sub.	1–3 "	1100	....	1100	....	900	1200	771
East Orange, N.J.	40 "	10 days	.....	1300	1400	1200	1200	1350	1600	920
Elizabeth, N.J.	Less sub.	.....	Less sub.	1600	1100	....	1300	....	1530	919
Everett, Mass.	20 days	½ pay	4 days	1600	850	....	....	900	1700	847
Greenwich, Conn.	Less sub.	.....	½	1600	1500	....	....	1000	....	582
Holyoke, Mass.	8 days	.....	½	1200	1200	1000	1100	1100	1400	767
Kingston, N.Y.	20 "	.....	5 days	900	850	800	....	....	....	630
Meriden, Conn.	Less sub.	4 days	.....	1300	950	1400	600	1000	1400	654
Montclair, N.J.	5 days	.....	.....	1700	1000	1400	2000	1200	1800	736
New Brunswick, N.J.	Less sub.	.....	4 days	1100	1050	....	....	....	1150	974
New London, Conn.	7 days	.....	.....	900	....	....	....	....	....	600
New Rochelle, N.Y.	Full	.....	.....	1600	1350	....	1300	1300	1350	996
Northampton, Mass.	2 days	.....	2 days	1400	900	....	800	....	....	411
Paterson, N.J.	.....	.....	.....	....	1000	....	....	1200	1800	883
Perth Amboy, N.J.	10 days	.....	.....	500	950	....	....	830	1400	....
Plainfield, N.J.	Full	.....	.....	1500	1200	....	1400	1000	1900	900
Port Chester, N.Y.	10 days	.....	.....	1150	1050	....	....	950	950	866
Poughkeepsie, N.Y.	Less sub.	3 days	2 days	1500	1000	1300	....	750	700	521
Quincy, Mass.	10 days	.....	.....	1000	1000	....	1350	....	660	772
Schenectady, N.Y.	Full	.....	.....	1400	1550	950	1250	....	....	696
Somerville, Mass.	15 days	.....	.....	1000	1000	1500	....	....	....	932
So. Manchester, Conn.	10 "	.....	.....	1000	1200	....	650	....	700	692
Waterbury, Conn.	Less sub.	.....	.....	1000	1000	....	1500	900	1500	994
West Hoboken, N.J.	Full	.....	.....	926	1700	....	....	....	....	....
White Plains, N.Y.	Full	.....	.....	900	900	900	900	....	900	763
Yonkers, N.Y.	20 days	.....	.....	1050	1800	1500	1500	1100	3500	....

SALARIES OF ELEMENTARY TEACHERS IN FOURTEEN CITIES, 1913 [1]

City	Average Salary	Median Salary	Lower Quartile	Upper Quartile
San Francisco, Cal....	$1152	$1200	$1140	$1224
Boston, Mass.....	1059	1176	792	1176
Chicago, Ill.....	1054	1175	925	1200
St. Louis, Mo.....	993	1032	972	1032
Newark, N.J.....	951	1000	730	1100
Cincinnati, Ohio.....	941	1000	850	1000
Minneapolis, Minn....	937	1000	900	1000
Milwaukee, Wis.....	886	876	876	876
Philadelphia, Pa.....	861	900	750	1000
Cleveland, Ohio.....	834	850	675	950
Washington, D.C.....	798	750	700	950
Indianapolis, Ind.:...	767	875	600	925
Baltimore, Md.....	722	700	600	800
New Orleans, La.....	668	700	600	750

MEDIAN ANNUAL SALARIES OF REGULAR TEACHERS IN SEVENTEEN CITIES [2]

City	Elementary Schools	Secondary Schools
Baltimore, Md.....	$ 700	$1200
Boston, Mass.....	1175	1620
Buffalo, N.Y.....	900	1200
Chicago, Ill.....	1175	1600
Cincinnati, Ohio.....	1000	1300
Cleveland, Ohio.....	900	1500
Indianapolis, Ind.....	875	1100
Newark, N.J.	1000	1900
New Orleans, La.....	700	1100
Philadelphia, Pa.....	900	1400
Portland, Oregon.....	1050	1350
Rochester, N.Y.....	800	1050
Salt Lake City, Utah...	830	1130
San Francisco, Cal.....	1200	1680
St. Louis, Mo.....	1032	1520
St. Paul, Minn.....	900	1300
Washington, D.C.....	750	1800
Average.....	934	$1397

[1] Cleveland Survey Report.

[2] Buffalo Survey, Salaries, 1914

A factor of importance in establishing a salary schedule is the rate of compensation prevailing in other occupations. Education and theology are not primarily remunerative

COMPARISON OF SALARY PER MONTH BASED ON A TWELVE MONTH YEAR, SALT LAKE CITY SURVEY, 1915

Public School Employees					
Elementary Schools	$ 40.00	to	$ 85.00	per	month
High Schools	41.66	"	116.66	"	"
H. S. Dept. Heads	100.00	"	133.33	"	"
City Employees					
Policemen	80.00	to	112.50	"	"
Firemen	80.00	"	100.00	"	"
Street Sweepers	1.75			"	day
Clerks in offices	75.00	"	100.00	"	month
Stenographers	60.00	"	75.00	"	"
Bank Employees					
Head Bookkeeper	90.00	"	125.00	"	"
Collectors	30.00	"	75.00	"	"
Tellers	100.00	"	150.00	"	"
Railroad Employees					
Bookkeepers	90.00	"	110.00	"	"
Traveling Men	100.00	"	150.00	"	"
Stenogs. and Sec'ys	50.00	"	100.00	"	"
Telegraph Operators	85.00	"	100.00	"	"
Store Employees					
Bookkeepers	75.00	"	110.00	"	"
Clerks, male	60.00	"	100.00	"	"
" female	60.00	"	80.00	"	"

occupations. Those who adopt such professions must, or ought to, be actuated somewhat by motives of social service, but they ought not to be excessively penalized for this altruism. It is incumbent on the community to make the material rewards so adequate as to prevent them from being forced into other lines of activity.

Salaries should be based on a study of the amount paid teachers in comparison with what they might reasonably expect if they entered other wage-earning occupations.

More important than any question of basal salary is that of annual increment. No progressive community devoted to the welfare of its schools opposes a reasonable yearly increase to those teachers who begin their service at a salary approximating the minimum wage established in the schedule. The community does expect, and rightly, that this annual increase shall be justified by a corresponding growth in efficiency. Higher pay and higher standards are practically inseparable, but it is incumbent upon the teacher to demonstrate the increased value of the service rendered prior to the demand for a greater compensation.

This principle makes prominent a subject which is frequently discussed in educational meetings, namely, the improvement of teachers in service.

It is a well recognized fact that teachers from the very nature of their profession are prone to form fixed and narrow habits. The character of their work, the doing of the same thing over and over again year after year, inevitably tends to reduce their methods to a mechanical routine, and only vital contact with fresh ideas, or regular, systematic effort on their part, will prevent such a misfortune. The investigation of some original problem in education often proves a stimulus to growth, and many a teacher has been saved by becoming so interested in some phase of her work that she has undertaken the collection of original data bearing upon the question. Reliance upon herself, not only for the method of research but also for the correct interpretation of the facts dis-

covered, produces a mental attitude which is the very antithesis of formalism.

When health and strength will permit, attendance upon the sessions of some summer school or upon the extension courses of a near-by university aids the professional growth of a teacher, with consequent advantage to the schools. Summer travel, opera, concerts, lectures, the theater, and similar forms of recreation, while not directly related to the work of the classroom, nevertheless give a degree of inspiration which is very effective in counteracting the deadening effect of daily routine.

Granting that the improvement in service resulting from the above methods directly benefits the community, there is no escape from the conclusion that teachers who try to increase their efficiency should receive a definite salary increase as compensation for their efforts. In the majority of school systems no such policy prevails. The teacher who spends her time and money in summer school work and the teacher who spends her vacations in mere pleasure-seeking, receive exactly the same financial recognition. This is wrong in principle, even though in some instances the service rendered the schools by the two types of teacher is equally valuable. The educational department owes it to the children in the schools and to the instructor in the classroom to encourage teachers to make the most of the ability of which they are possessed. Financial recognition of an effort to increase professional skill is the most obvious method that can be employed. The argument that such additional training will ultimately secure professional recognition in some indirect manner is too remote a contingency to serve the purpose. The average person needs the stimulus of an immediate reward.

CHAPTER VI

PUPILS

SINCE it is the business of the educational authorities to see that children of the compulsory school age are in attendance, the necessity for a complete and accurate census is apparent. Only when the school enrollment has been checked by the census list and all children have been accounted for in a satisfactory manner can it be assumed that the school authorities have discharged their obligation to the community. Unfortunately in the majority of instances such a careful accounting is not practiced. Too often the census returns are ignored, and the enrollment is assumed to show the number of children who come within the scope of the compulsory attendance law. Such a condition as this ought not to exist. The school officials should *know*, not guess or compute, the number of children of school age within their jurisdiction, the number enrolled in the public schools, those in attendance at private or parochial schools, and, finally, the actual number not in any schools, with the reasons for non-attendance.

The extent of the failure of school officials to meet their obligations in this respect is revealed by the entire absence of authoritative data indicating the percentage of justifiable discrepancy between enrollment and the census list. Even in the published reports of surveys made recently, the experts in charge, lacking definite information, have been compelled to estimate the extent to which

non-compliance with the statutes of compulsory education prevails.

Accurate census returns may seem unnecessary in the small town where the vigilance of attendance officers and the constant visits of the school nurse make it difficult to evade the requirements of the compulsory attendance law, and where private citizens frequently supplement the efforts of the officials by reporting the names of those children whom they know to be truants. The fact that children of school age are rarely found on the streets of the small towns also helps to justify the assumption that evasion of the law is the exception rather than the rule, but assumption is not evidence, and it would seem advisable that a census should be made at least every third year. Attendance rolls should then be checked by the census list and every child accounted for. Even better than such a three-year census would be a perpetual census maintained by securing the coöperation of the pupils, since this would not only result in providing data for school guidance but would also give the children valuable training in civic responsibility.

Various causes, such as ill health, or attendance at private and parochial schools, will always operate to produce a discrepancy between the number of children of school age in the community and those actually in attendance at public schools. Only a careful checking of the census returns will show where the missing children are, but the obligation rests squarely upon the school department to account for every one of them in a satisfactory manner. The number of those who must be sought out individually appears in the comparative statistics of the cities used as illustrations.

CHILDREN OF EACH AGE IN CLEVELAND REPORTED BY THE SCHOOL CENSUS OF MAY, 1915, AND THE NUMBER ENROLLED IN THE PUBLIC SCHOOLS IN JUNE, 1915 [1]

Age	Census	In Public Schools	Per Cent in Public Schools
6	14,584	8,435	58
7	13,844	9,827	71
8	13,560	8,903	65
9	12,140	8,371	69
10	11,939	8,044	67
11	10,914	7,340	67
12	11,458	7,346	64
13	10,321	7,307	71
14	10,359	6,716	65
15	9,269	4,649	50
16	10,005	2,353	13
17	9,980	1,352	14
18	11,674	761	6
19	10,381	291	3
20	10,713	93	.09
	171,141	81,788	47.8

Reckoning the compulsory school age as 7–14, here are approximately 27,000 additional children not in attendance at the public schools. The number seems appallingly large, but doubtless the greater proportion of these attend parochial and private schools and a checking process would disclose the fact.

Springfield, Mass., affords an illustration of what even a large system may do in accounting for all pupils in the city.

Butte, Mont., reveals the same general conditions, and a similar showing would doubtless be made by like comparisons in almost every city.

[1] Cleveland Survey Report.

School Attendance and Census Enumeration, Springfield, Mass.

School Attendance

Ages	5	6	7	8	9	10	11	12	13	14	15	Totals
Public Schools.....	1263	1478	1449	1252	1296	1256	1242	1297	1286	1263	940	14,022
Parochial Schools ...	201	285	310	293	300	292	279	250	182	162	120	2,674
Private Schools.....	13	6	4	7	10	6	7	6	8	12	16	95
At Home.....	199	66	18	12	7	12	6	8	12	26	76	442
At Work.....	....	....	....	....	....	....	....	....	....	61	186	247
Totals.....	1676	1835	1781	1564	1613	1566	1534	1561	1488	1524	1338	17,480

Census Summary

Ages	5	6	7	8	9	10	11	12	13	14	15	Totals
Public Schools.....	1264	1431	1278	1271	1256	1244	1246	1248	1310	992	759	13,299
Parochial Schools....	216	259	261	314	308	281	249	202	212	150	102	2,554
Private Schools.....	4	5	6	13	2	7	3	9	7	11	25	92
At Home.....	212	42	19	12	8	6	9	8	4	61	96	477
At Work.....	....	....	....	....	....	....	....	....	....	127	306	433
Totals.....	1696	1737	1564	1610	1574	1538	1507	1467	1533	1341	1288	16,855

PUBLIC SCHOOL ENROLLMENT *vs.* SCHOOL CENSUS, BUTTE, MONTANA

Age	In Public Schools	School Census	Per Cent in Public Schools
6– 8.....	1,619	2,019	79.40
8–14.....	3,996	5,330	75
14–16.....	643	1,418	45
16–21.....	55	3,082	1.80
High School.....	727	....	....
	7,040	11,849	59.4

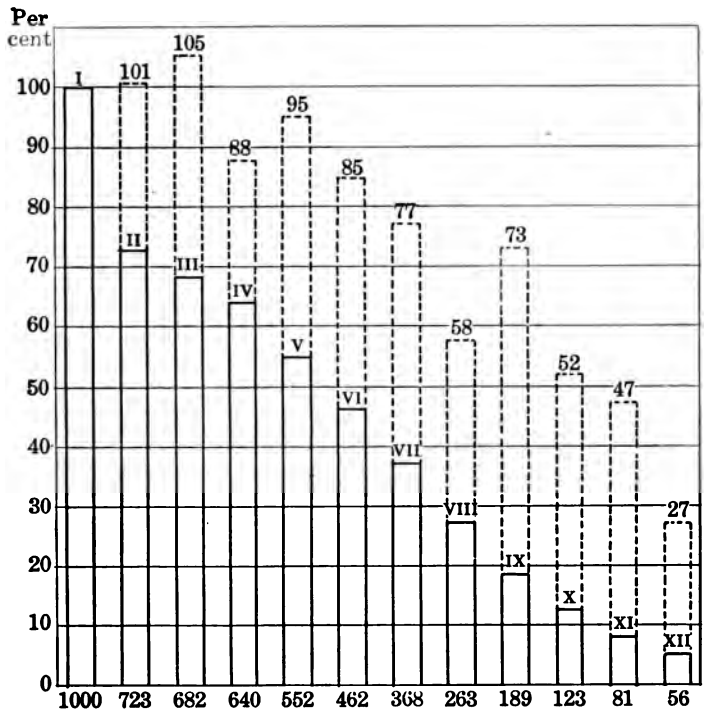
It is difficult to overestimate the importance of such data in determining the extent to which the school system is meeting its obligations, for every city must enforce the compulsory attendance law and accurate and complete census returns are the only basis for intelligent action.

The distribution of the pupils in the grades, which is the easiest fact concerning a school system to secure, provides direct evidence of the holding power of the schools. With conditions absolutely constant, a table of this character would give one hundred pupils in the twelfth grade for every hundred entering the first grade, but this simple condition never exists. Illness, and change in population due to removal from the city, together with a constant elimination for various causes, result in a slowly lessening enrollment up to the sixth grade and a very rapid decline from that grade to the end of the twelfth.

Dr. Ayres' chart of distribution for 386 cities is sufficiently comprehensive to furnish a satisfactory basis for comparison. The chart given here shows the distribution in a New Jersey city as compared with the Ayres table.

The following diagram gives graphically Dr. Ayres'

distribution in 386 cities on the basis of 1000 children in the first grade, in comparison with the distribution in one town with 444 in the first grade. The single system is shown by the dotted oblong. The height of the columns



indicates the per cent of the first grade enrolled in the higher grades.

This diagram represents a typical condition: large numbers of children are in the lower grades and comparatively small numbers in the upper grades, a situation which constitutes one of the serious problems confronting

school administrators. There are several reasons for such a distribution: (1) When a school system is growing, the children who produce the increase are more likely to enter the lower than the higher grades. (2) When children repeat grades, progress through school is retarded and the membership of the lower grades is increased. (3) Many children, for economic reasons or because of indifference or incapacity, leave school on reaching the limit of the compulsory school age. (4) Mortality has a small effect on the decrease.

Since this problem of decreasing enrollment is universal, it becomes important to determine its extent in any school system as compared with other schools. If it does not appear to be disproportionate, the school is evidently meeting the situation as efficiently as others are. Should the decrease be in excess of the prevailing rate, it becomes imperative, as the first step in correcting the condition, to search out the cause of the unusual amount of elimination. On the other hand, a comparatively good record does not relieve the school from the obligation to put forth every effort to increase its holding power to a still higher degree.

It is not sufficient to compare any single city with so large a group as that included in Dr. Ayres' study. Conditions vary widely, and a situation unavoidable in one community might not exist in another of a different character. The following table, giving the distribution of pupils by single cities, provides a check upon the massed figures used by Dr. Ayres. In this table the figures show by per cents the relation of each grade enrollment to the total enrollment.

PERCENTAGE OF TOTAL ENROLLMENT IN EACH GRADE

Grade	Springfield, Ill.	Cleveland, Ohio	Montclair, N.J.	La Crosse, Wis.	Solway, N.Y.	Brookline, Mass.	Newton, Mass.
I.....	12.1	16.4	8.3	9.5	14	10	10.1
II.....	13	13.6	9.1	12.2	8.3	10	9.4
III.....	14.1	13.3	9.4	10.7	15.7	8	8.5
IV.....	12.4	12.2	7.9	10.4	12.8	10	8.1
V.....	12	11.2	8	9.5	9.9	10	8.9
VI.....	9.8	9.3	7.2	9.6	6.9	9	7.3
VII.....	8.4	8.1	7.1	8.5	16.1	9	7.7
VIII.....	6	6.1	5.3	6.2	5.7	8	6.7
IX.....	4.3	3.5	6.7	9.2	4.2	8	8.3
X.....	3.4	2.6	4.8	5.9	3.5	6	6.8
XI.....	2	1.9	4.4	4.6	2.7	5.5	5.7
XII.....	2	1.7	2.5	3.2	1.6	4	4.3
XIII.....						2.5	

One of the most significant facts in the distribution of attendance is the extent to which the school succeeds in

PERCENTAGE EACH AGE IS OF TOTAL ENROLLMENT

Between Years	Montclair		Butte		Paterson		Newton	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
4– 5.....	269	6	...	....	444	1.1	178	2.5
5– 6.....	310	6.9	22	.03	2164	9.5	454	6.4
6– 7.....	401	8.9	912	14.4	2312	10.1	549	7.7
7– 8.....	408	9.1	707	11.2	2226	9.8	582	8.2
8– 9.....	390	8.6	702	11.1	2168	9.5	550	7.7
9–10.....	346	7.7	726	11.5	2223	9.8	586	8.2
10–11.....	347	7.7	642	10.3	2096	9.2	605	8.5
11–12.....	345	7.6	662	10.5	1994	8.8	591	8.3
12–13.....	333	7.4	671	10.6	2004	8.8	584	8.2
13–14.....	331	7.4	593	9.4	1845	8.1	596	8.3
14–15.....	307	6.8	415	6.6	1541	6.8	534	7.6
15–16.....	274	6.1	228	3.6	675	2.9		
16–17.....	207	4.6	44	.06	586	2.1		
17–18.....	123	2.7	9	.01	350	1.1	1382	19.5
18–19.....	71	1.6	2	.005	127	.5		
19–20.....	37	.9	...	....	75	.3		
20–21.....	...	...	...	....	58	.1		

holding pupils beyond the compulsory school age, which in most states is fourteen years. The ratio of the number of pupils beyond this age to the total enrollment is readily obtained from the preceding table, which gives the percentage of children of the different ages in attendance.

An industrial city of the character of Paterson, N.J., where only 14.9% of the school children are fourteen years of age or more, cannot be expected to equal the record of the residence town of Newton, Mass., which has few industries to stimulate the wage earning impulse of the pupils, but comparison can easily be made between two cities of a similar type, and this shows in a striking fashion the extent to which the school succeeds or fails in making the curriculum furnish a direct appeal to the interests of pupils or in securing an appreciation on their part of the commercial value of an education.

A material factor in determining the efficiency of any educational system is the percentage of pupils who remain for the entire course. Such information is not easy to secure as almost no reports of superintendents give the number of children entering school each year; consequently students of education are forced to make their own estimate. One method is to assume that the same number of children are born each year in a city, in which case the largest age group enrolled in the schools would constitute the yearly entering number.

More accurate is the plan followed by Dr. Leonard Ayres, which consists in taking the average of the age groups from seven to twelve years of age. While this number is not absolutely correct, it is reasonably so, and furnishes a safe basis for comparison. A complete discussion of this important question appears in Dr.

Ayres' book *Laggards in Our Schools*, with a list of fifty-nine cities showing persistence of attendance for the twelve grades. The percentage of beginners remaining in grades eight and twelve for ten cities estimated on this basis is given here.

PERCENTAGE OF BEGINNERS REMAINING IN GRADES VIII AND XII IN AYRES' GROUP OF 59 CITIES AND 10 SINGLE CITIES

City	Percentage Remaining Grade VIII	Percentage Remaining Grade XII
Ayres' Median, 59 cities..	51	10
Montclair, N.J.....	90	40
Springfield, Ill.....	45.5	18.5
Boise, Idaho.....	75	28
Paterson, N.J.....	63	No data
Rockford, Ill.....	76	26
Springfield, Mass.....	65	19
Butte, Montana.....	54	No data
Brookline, Mass.....	89	29[1]
Newton, Mass.....	85	54
N. Attleborough, Mass....	76.6	28

In every community are found some parents so indifferent to the educational progress of their children as not to require their regular attendance at school sessions, although no child who fails to be present at least seventy-five per cent of the time can hope to be promoted. It is difficult to enforce the compulsory attendance laws in such cases, because of the prescribed routine which usually requires that notice of intention to prosecute shall be given a specified number of days in advance. The parent, being thus warned, escapes the penalty by sending the child back to school for a time. Besides these avoidable absences, sickness and other legitimate

[1] Grade XIII.

reasons help to swell the number of days of non-attendance. The success of various school departments in making parents realize the importance of regular school attendance is indicated by the following table.

PERCENTAGE OF ATTENDANCE IN TWELVE NEW JERSEY TOWNS

Town	Number School Days (200 possible)	Percentage Attendance
Belleville	197	96.6
Bloomfield	188	90
Caldwell	188	88.8
East Orange	187	91.9
Glen Ridge	181	89.5
Irvington	193	92.7
Millburn	191	90.1
Montclair	188	90.6
Nutley	188	91
Orange	197	94.8
South Orange	187	91
West Orange	193	92.3
Median	189	91

In computing percentage of attendance it is customary to insure high rank by dropping from the roll the names of pupils who have been absent a specified number of days. The resulting massed figures give no information concerning the persistence of attendance. So far as the individual is concerned it is impossible to determine whether he has been present most of the time or not. The fluctuations from day to day are really nothing but surface indications of the weather conditions or the attractiveness of other interests. The vital consideration of this whole matter is the comparison of the actual number of days the child attends school with the possible maximum.

Assuming that the presence of pupils at three fourths of the school sessions is a reasonable prerequisite for promotion it follows that the statistics of attendance arranged by fourths of the school year will show what percentage of the children may expect advancement.

PERSISTENCE OF ATTENDANCE OF PUPILS IN DIFFERENT CITIES[1]

City	Less than one fourth	Less than one half	Less than three fourths	More than three fourths
Dayton, O.	4.7%	9.2%	21.6%	78.4%
Grand Rapids, Mich.	6.7	14.8	27.5	72.5
Cleveland, O.	8.6	18.3	28	72
Springfield, O.	6.5	13.7	28.2	71.8
Syracuse, N.Y.	6.2	16	29.7	70.3
St. Louis, Mo.	10.1	20	32.9	67.1
Kansas City, Mo.	10.6	20.8	35.1	64.9
New Orleans, La.	7.7	21.3	37.4	62.6
Columbus, O.	6.9	18.1	38.6	61.4
Average	7.5	16.9	31	69

This table discloses the striking fact that in every city, with one exception, less than 75% of the pupils are in actual attendance at school more than three fourths of the time.

Three of these cities publish figures which make possible a comparison between regularity of attendance and percentage of promotion.

COMPARISON BETWEEN PERCENTAGES OF ATTENDANCE AND PROMOTION IN THREE CITIES[2]

City	Per cent present at least ¾ of year	Per cent promoted
Springfield, O.	71.8	72.8
Syracuse, N.Y.	70.3	64.9
New Orleans, La.	62.6	54.9

[1] Leonard Ayres, *Laggards in Our Schools.* [2] *Ibid.*

The reason for the low percentage of promotion in the preceding table is that Dr. Ayres has compared the number of pupils promoted with the whole number enrolled, not with those still enrolled on the last day of the year, as is commonly done.

Tables relating to age and grade statistics are frequently found in school reports, probably because the amount of retardation is readily obtained and the figures are very easy of interpretation. Excessive retardation is symptomatic of a poorly adjusted curriculum, lacking in flexibility, and is the direct result of an excessive percentage of non-promotion. Age and progress studies naturally accompany the retardation table, and the two are essential to a clear understanding of any school situation. Age and progress facts are more difficult to obtain, since they must come either from a study of individual biographical cards or from questioning the pupils. The latter plan involves the risk of considerable error, the memory of children with respect to repetition of grades being by no means reliable. A study made in the writer's own school system indicates that normal and accelerated pupils usually know what has happened to them, but with retarded pupils the uncertainty is noticeable. In the study referred to, 30 per cent of the retarded pupils reported normal progress; 4.5 per cent gave one year less than they had actually lost, and another 4.5 per cent two years less. Plainly the facts should be secured from biographical cards whenever this source of information is available, but unfortunately these cards are often lacking.

A comprehensive study of both age and grade and age and progress has been made by the Russell Sage Founda-

NUMBER OF PUPILS AND PERCENTAGE CLASSIFICATION IN AGE AND PROGRESS

GROUPS FOR 29 CITIES, JUNE, 1911

City	Number Pupils	Age Classification % Young	% Normal	% Old	Progress Classification % Rapid	% Normal	% Slow
Amsterdam, N.Y...	2,371	49	23	28	30	49	21
Bayonne, N.J.....	7,033	27	31	42	18	47	35
Canton, Ohio.....	5,567	28	38	34	2	55	43
Danbury, Conn....	1,967	38	31	31	12	57	31
Danville, N.Y.....	2,260	28	34	38	7	55	38
E. St. Louis, Ill....	5,380	22	34	44	15	48	37
Elizabeth, N.J.....	7,058	23	31	46	12	48	40
Elmira, N.Y.....	2,487	38	28	34	10	53	37
Hazleton, Pa.....	2,655	22	36	42	3	53	44
Indianapolis, Ind...	23,874	34	37	29	19	56	25
Kenosha, Wis.....	2,223	16	36	48	7	46	47
Milwaukee, Wis....	32,251	28	41	31	17	61	22
Montclair, N.J.[1]...	3,941	22	62	16	10	60	30
Muskegon, Mich...	3,163	25	40	35	14	55	31
New Orleans, La.[2]	23,664	20	31	49	13	51	36
New Rochelle, N.Y.	3,641	36	30	34	19	51	30
Niagara Falls, N.Y.	3,244	31	33	36	6	60	34
Passaic, N.J.....	5,541	17	32	51	14	48	38
Perth Amboy, N.J..	3,947	27	32	41	13	38	49
Plainfield, N.J.....	2,312	30	30	40	6	56	38
Quincy, Mass.....	4,540	50	31	19	4	52	44
Racine, Wis.....	4,075	30	42	28	3	69	28
Reading, Pa.....	10,585	25	35	40	6	47	47
Rockford, Ill.....	5,649	28	40	32	15	56	29
Schenectady, N.Y..	7,846	26	30	44	9	52	39
Syracuse, N.Y.....	13,610	42	29	29	7	54	39
Topeka, Kan.....	4,894	26	38	36	11	58	31
Trenton, N.J.....	8,787	31	31	38	7	49	44
Watertown, N.Y...	3,303	25	32	43	10	49	41

tion and is reproduced here.[3] The table is based upon the returns from twenty-nine cities involving 206,495

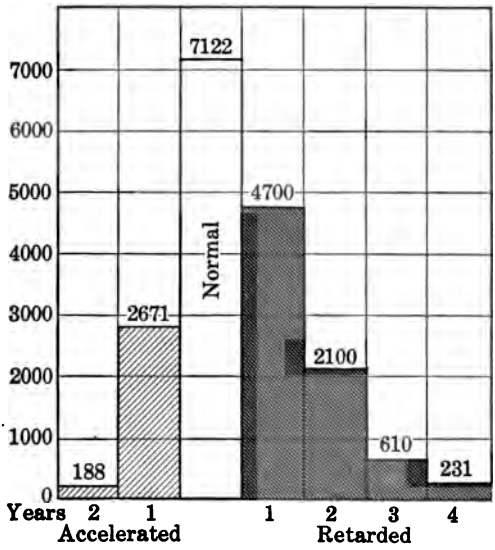
[1] 1916 figures. [2] White.

[3] *Identification of the Misfit Child*, Leonard Ayres, Russell Sage Foundation.

children and followed the usual method of reckoning an eight-year-old child in the first grade as one year over-age, a nine-year-old child in the second grade a similarly handicapped and so on up the grades.

In making a study of this character there should be included not only the question of amount of retardation but also the number of years the different pupils have fallen behind their respective grades. The Survey Report for Salt Lake City presents the facts for that city graphically.

DEGREE OF ACCELERATION OR RETARDATION OF PUPILS IN THE SALT LAKE CITY SCHOOLS



It should be remembered that these age-grade statistics were taken at the end of the school year, and include all pupils from the kindergarten to the twelfth grade inclusive.

The Survey Report for Butte, Montana, with an enrollment of 6337 gives the following distribution.

Under Normal Age		Normal Age	Over Normal Age			
One year and more	Less than 1 year		Less than 1 yr.	1 yr. and less than 2	2 yrs. and less than 3	3 years or more
8	460	2,603	1,790	891	386	199

Rockford, Ill., enrollment 6929, reports 2573 over-age pupils distributed as follows:

One year behind	1,533
Two years behind	684
Three years behind	242
Four years behind	76
Five years behind	28
Six years behind	7
Seven years behind	3

The 1914–15 report of the Superintendent in Passaic, N.J., gives the distribution of retarded pupils in that city for the different grades.

RETARDATION IN PASSAIC, N.J., 1915

Grades	I	II	III	IV	V	VI	VII	VIII	Total	Per cent of all Retarded
Retarded 1 yr.	94	187	245	260	226	191	88	51	1342	69.03
" 2 "	9	38	91	72	92	79	45	9	435	22.38
" 3 "	5	7	26	39	21	20	3	1	122	6.27
" 4 " or more	1	4	8	19	10	3			45	2.27
Total retarded	109	236	370	390	349	293	136	61	1944	
Total enrolled	1029	1226	1281	1058	1105	824	578	409	7510	
Per cent retarded	10.5	19.2	28.8	36.8	31.5	35.5	23.5	14.9	25.89	

Similar facts are reported for the high school of La Crosse, Wisconsin.

Age and Grade			Age and Progress		
Under Age	Normal Age	Over-age	Rapid Progress	Normal Progress	Slow Progress
17.5%	34.1%	48.4%	28.7%	39.8%	31.5%

The significance of such statistics is realized when we remember that the majority of over-age children become discouraged and drop out of school before the completion of their course. Even while they remain in school they fail to receive the type of instruction suited to them, and their improper classification diverts the attention of the teacher from those who are rightly placed in the grade.

When the causes of retardation are sought, almost insurmountable obstacles are encountered. Reports of teachers giving reasons for failure have as the only basis their best judgment, but human inability to see behind surface indications and grasp the fundamental causes renders this judgment of little value. The apparent indifference of a pupil may be caused by a failure on the part of the school to provide a real motive for exertion. The causes of a pupil's attitude are complex, and really to know why he persists in any line of conduct presupposes the ability to enter into his mind and get his point of view. Despite the natural difficulties of the question, several studies have been made to determine some of the chief reasons for pupil failure. One of the most extensive of these is a summary of the reports from twenty Indiana cities

Extent of over-ageness in any school system is vitally affected by percentage of non-promotion, but superintendents as a rule fail to recognize that the control of this factor lies almost entirely in their own hands. Actuated by the most worthy motives they set up too high a standard of attainment, and an excessive rate of non-promotion results. On the other hand, the standard might be so low as to enable practically all pupils to reach it, but the possible outcome would be their failure on

encountering the future demands of higher institutions. Somewhere between these two extremes lies the safe road for the school to follow.

CAUSES OF RETARDATION IN TWENTY INDIANA CITIES[1]

Cause	Total Reported		Per Cent of Enrollment	
Mentally defective...	Boys 302	540	2.3	
	Girls 238			
Physically defective..	Boys 157	284	1.2	
	Girls 127			
Sickness.....	Boys 167	320	1.3	
	Girls 153			
Truancy.....	Boys 28	36	.15	
	Girls 8			
Poor home life.....	Boys 234	384	1.6	
	Girls 150			
Late start.....	Boys 129	245	1	
	Girls 116			
Laziness.....	Boys 273	342	1.4	
	Girls 69			
Overworked.....	Boys 11	24	.1	
	Girls 13			
Change of schools....	Boys 247	438	1.8	
	Girls 191			
Irregular attendance .	Boys 155	280	1.1	
	Girls 125			
Poor teaching.....	Boys 15	24	.1	
	Girls 9			
Timidity.....	Boys 20	55	.2	
	Girls 35			
Other causes.....	Boys 261	451	2	
	Girls 190			
Total retarded...	Boys 1999	3,423		
	Girls 1424			
Total enrollment.		23,253		
Per cent retarded		14.7		

[1] Report Second Annual Conference on Educational Measurements, Indiana University.

No question in administration is more difficult of solution than this, and no hard and fast rules for determining the fitness of the child for promotion can be given. Examinations do not reveal the capacity of the pupil, and the daily marks given by teachers are equally unreliable. Experience indicates that the deliberate judgment of the trained teacher at the close of the year is as dependable a basis as can be found, especially if the degree of flexibility in the administration of the school is such that a re-classification of the pupil can be made whenever it is apparent that a mistake in judgment has occurred. The reports of school superintendents for 1916 indicate that approximately 10% of pupils fail of promotion. This is shown in the table given below.

PERCENTAGE OF NON-PROMOTION IN TEN CITIES

City	I	II	III	IV	V	VI	VII	VIII	Total
Ashland, Ore.....	13	6	4.3	4.5	7.3	6.6	5	3.2	6.3
Boise, Idaho.....	13.8	1.8	2.7	2.9	1.1	2.3	2.8	1.8	4
Butte, Mont.....	24	17	14	14.5	13.5	17	21.5	11	18
Cleveland, Ohio ..	15.5	12.3	12.4	14.6	17.8	17.2	17	9.8	14.6
Des Moines, Ia...	9.5	5.5	7.6	8.5	6.5	6.5	4.4	2.5	6.6
Malden, Mass....	14	10.8	10.3	4.5	7.8	7.6	4.1	6	7.9
Montclair, N.J....	7.8	5.3	12	11.5	9	10.7	14	15	10.2
New Orleans, La..	9.4	14.7	12.6	15	15.2	16.2	10.6	3.2	14.2
Passaic, N.J.....	24	18.5	20.1	6.2	9.2	9.7	6.3	6.4	12.7
Paterson, N.J.....									11.7

However unsatisfactory the promotion conditions may be in any school system, no real improvement can result from an arbitrary change in the promotion rate. The only sound method of procedure is the making of a careful study of the situation in coöperation with principals and teachers. Then, with a clear appreciation of the

seriousness of the problem, definite rules of action can be formulated for its solution.

Before steps can be taken to correct the evil of excessive failures, it may be necessary to ascertain the subjects in the curriculum which are causing the difficulty, but such statistics are not usually given in school reports. The Butte Survey has the following significant figures.

FAILURE BY STUDIES

City	No. in Class at End of Semester	Reading	Arithmetic	Language	Spelling	Geography	Physiology	U.S. Hist.
Butte, Mont.....	5744	396	497	221	143	165	100	27
		6.9%	8.6%	3.8%	2.5%	2.9%	1.7%	.05%

	Writing	Drawing	Music	Manual Training	Sewing
Butte, Mont.....	31	20	29	7	2
	.05%	.03%	.05%	.01%	.003%

PERCENTAGE OF THE TOTAL NUMBER OF FAILURES IN EACH GRADE IN EACH SUBJECT — CLEVELAND [1]

Subject	Grades I	II	III	IV	V	VI	VII	VIII
Reading.....	92	64	27	16	8	5	3	3
Arithmetic.....	...	22	60	47	42	35	29	28
Spelling.....	...	...	7	11	7	5	3	4
Language.....	...	...	6	21	20	14		
Geography.....	...	...	...	6	23	27	12	10
Grammar.....	...	...	...	...	...	11	29	33
History.....	...	...	...	....	...	....	27	23

In the high school, departmental teaching makes it necessary to consider failures by subjects. Data of this character do not appear as a rule in school reports, but the condition has been studied in a large number of high

[1] Cleveland Survey Report.

schools. In 1916 a group of fourteen superintendents in New Jersey made a coöperative study of high school failures involving over 24,000 records, a number sufficiently large to be indicative of prevailing conditions. The total number of marks tabulated was as follows:

Mathematics	4,811
Latin	2,420
History	3,206
German	2,632
Business subjects	5,434
English	6,392
Total	24,895

HIGH SCHOOL FAILURE IN FOURTEEN NEW JERSEY CITIES

School	Total Failure [1]	Fresh.	Soph.	Jun.	Sen.	Eng.	Latin	German	Math.	Hist.	Business
A	18.2	....	....	...	....	22	26	22	21	14	11.5
B	17	19	19	16	4	14	20	26	27	8	11
C	16	19	20	8	9	7	20	29	15.5	5	22
D	20	34	19	12	11	..	..	..	..	..	..
E	11	13	14	4	5	16	13	1	13	13	8
F	16.2	....	....	...	....	14	20	27	26	11	21
G	12	17	10	6	2	15	16	6	12	11	4
H	8	12	10	5	3	8	10	8	18	8	12
I	27	31	33	25	9	24	23	26	36	30	22
J	14	19	16	1	0	9	26	23	14	7	15
K	8	10	9	4	4	3	18	13	22	6	9
M	16	18	17	14	7	11	15	16	31	12	9
N	13	....	....	...	....	10	10	15	20	13	10
O	8	....	....	...	....	8	14	7	9	7	7
Median	15	18.5	16.5	7	4.5	11	18	16	20	11	11

In Ohio similar data in four subjects — Algebra, Latin, 1st English, 2nd English — were collected by R. D.

[1] The figures give the per cent of failure.

Bennett, of Westville, for forty representative high schools with an enrollment of 15,000 pupils. The forty schools were divided into two groups according to size and the median percentage of failure for each group is here reproduced.

PERCENTAGE OF FAILURE BY SUBJECT

	Algebra	Latin	1st English	2nd English
Large high schools...	17	22.5	11.5	10.5
Small high schools...	14	14.5	5.5	8

In both of these studies only pupils remaining in the class to the close of the year were considered. To furnish complete information to any high school principal, similar data are needed for all others enrolled at the beginning of the year; but without doubt the majority of pupils who dropped out of school would be included in the list of failures.

Educational science is not sufficiently developed at the present time to enable us to determine with any assurance of accuracy the effect of class size upon the progress of children through the schools. Several studies indicate that large classes do not result so disastrously to pupil progress or class efficiency as has been commonly supposed. Nevertheless, the fact that private schools, although operated for financial gain, maintain small classes, and that educators and laymen, with hardly a dissenting voice, declare small classes are a distinct advantage to the children concerned, implies that some elements in the problem still require investigation.

This question vitally concerns every school superintendent since no single item so radically affects the

per capita cost of education as the size of the classes in the system. According to the best information available, the prevailing practice respecting the size of classes in different cities is as follows:

AVERAGE SIZE CLASSES IN TWENTY-TWO CITIES [1]

City	Number of Children per Teacher-Elementary Average Attendance	Number of Children per Teacher-Secondary Average Attendance
Baltimore, Md.	33.1	19.1
Boston, Mass.	36.4	26.9
Buffalo, N.Y.	28	22.5
Cincinnati, Ohio	29.4	20.5
Cleveland, Ohio	37.4	20.2
Detroit, Mich.	33.6	19.6
Indianapolis, Ind.	30.9	22.9
Jersey City, N.J.	38.4	23.3
Kansas City, Mo.	30.2	15.2
Los Angeles, Cal.	26.8	18.1
Milwaukee, Wis.	35.1	18.6
New Orleans, La.	29.3	20.2
Omaha, Neb.	27.7	20
Pittsburgh, Pa.	31	18.6
Portland, Ore.	26.7	23.3
Rochester, N.Y.	23.3	16.9
Salt Lake City, Utah	30.3	11.3
San Francisco, Cal.	35.6	27.2
Seattle, Wash.	31.7	19.8
St. Louis, Mo.	38.2	19.2
St. Paul, Minn.	51.1	18.7
Washington, D.C.	28.6	18.2
Average	32.4	20

[1] Buffalo Survey Report.

SIZES OF CLASSES BY GRADES [1]

Grade	Maximum Number of Pupils per Teacher	Minimum Number of Pupils per Teacher	Average Number of Pupils per Teacher
Kd.....	52	22	36.4
I.....	65	22	44.2
II.....	59	17	39.2
III.....	45	15	37.7
IV.....	55	14	38
V.....	50	19	38.5
VI.....	63	21	39.3
VII.....	49	23	36.4
VIII.....	43	20	33.6
IX.....	46	11	28.7

In the following table appears the average number of pupils per teacher in various cities as compiled from published reports.

AVERAGE NUMBER OF PUPILS PER TEACHER

City	No. Elementary Teachers	Elementary School Average	No. High School Teachers	High School Average	Average All Schools
Springfield, Mass...	363	34.5	66	19.6	...
Newton, Mass.....	168	34.3	53	26.6	31.1
Paterson, N.J.....	469	37	70	29	33.5
Brookline, Mass....	98	33	...	...	...
Pasadena, Cal.....	...	...	...	...	19.2
Berkeley, Cal.....	...	...	...	...	24.6
Denver, Colo.....	...	...	...	...	25.8
Seattle, Wash.....	...	...	...	...	27.2
Portland, Ore.....	...	...	...	...	28.7
Tacoma, Wash.....	...	...	...	...	33.8
Stamford, Conn....	...	...	...	...	36.7

[1] Buffalo Survey Report.

CLASS SIZE TWENTY-FIVE HIGH SCHOOLS IN MIDDLE WEST AND IN TWO SINGLE CITIES[1]

Subject	25 High Schools	Butte, Mont.	Montclair, N.J.	Safety Zone
Music	58	...	...	42–88
Physical training	32	...	79	28–55
English	22	21.7	23	20–24
Mathematics	21	19.8	21	18–24
History	21	20.4	23	17–23
Science	20	20.1	19	16–22
Commercial subjects	19	21.9	20	15–23
Drawing	18	14.4	10	14–24
Modern languages	17	11.8	18	15–20
Latin	17	15.1	20	14–19
Household arts	17	14.0	12	13–23
Manual training	14	12.4	13	12–18

PUPILS PER TEACHER IN MASSACHUSETTS HIGH SCHOOLS[2]

City	Number Teachers	High School Average
Boston	508	29.5
Worcester	126	26.4
Cambridge	91	26.5
Somerville	69	27
Brockton	54	25.5
Malden	40	28.1
Fitchburg	34	26.3
Everett	31	28.8
Chelsea	22	24.1
Pittsfield	32	23.5
Chicopee	14	20.1
Medford	27	30.9
Melrose	27	29.7
Brookline	29	20.5

[1] School Report, Topeka, Kansas, 1914–15.
[2] State Commissioner's Report, 1912–13.

NUMBER OF CLASSES OF VARYING SIZE — MASSACHUSETTS HIGH SCHOOLS — 1916

Group	1–5 Pupils	6–10 Pupils	11–15 Pupils	16–20 Pupils	21–25 Pupils	26–30 Pupils	31–35 Pupils	Over 35 Pupils	Total Classes
1.....	100	384	1093	2167	2700	2418	1614	1613	12,089
2.....	100	393	612	843	726	521	259	112	3,566
3.....	142	296	419	404	277	178	69	26	1,811
4.....	190	404	320	269	130	33	16	8	1,370
5.....	243	300	220	89	35	7	5	0	899
Total	775	1777	2664	3772	3868	3157	1963	1759	19,735

Group 1 consists of 57 High Schools enrolling over 500 pupils each
" 2 " " 45 " " " 200–500 " "
" 3 " " 46 " " " 101–200 " "
" 4 " " 52 " " " 51–100 " "
" 5 " " 51 " " " 50 or fewer " "

AVERAGE SIZE OF CLASSES IN HIGH SCHOOLS IN 19 CITIES, 1914[1]

City	No. Teachers	No. Pupils Average Attendance	Pupils per Teacher
Baltimore, Md.....	228	4,365	19.1
Boston, Mass.....	505	13,570	26.9
Buffalo, N.Y.....	163	3,673	22.5
Cleveland, Ohio....	354	7,167	20.2
Cincinnati, Ohio....	188	3,863	20.5
Detroit, Mich.....	285	5,594	19.6
Indianapolis, Ind....	167	3,832	22.9
Jersey City, N.J....	124	2,893	23.3
Kansas City, Mo....	228	4,362	19.1
Los Angeles, Cal....	480	8,696	18.1
Milwaukee, Wis.....	220	4,090	18.6
Minneapolis, Minn..	288	6,207	21.6
Newark, N.J.....	173	3,245	18.8
New Orleans, La....	95	1,920	20.2
Pittsburgh, Pa.....	288	5,367	18.6
San Francisco, Cal..	118	3,198	27.1
Seattle, Wash.....	235	4,656	19.8
St. Louis, Mo.....	311	5,959	19.2
Washington, D.C. ..	316	5,770	18.3
Average.....			20.8

[1] Cleveland Survey Report.

ENROLLMENT PER TEACHER — SMALL TOWNS IN NEW JERSEY

Town	Kd.	I–IV	V–VIII	IX–XII
Belleville.....	..	41	39	23
Bloomfield.....	46	36	27	20
Caldwell.....	35	32	34	28
East Orange...	43	41	37	28
Glen Ridge....	36	25	31	18
Irvington.....	..	46	42	27
Millburn.....	29	28	31	13
Montclair.....	21	32	26	24
Nutley.....	51	40	38	21
Orange.....	45	45	26	28
South Orange..	25	34	33	25
West Orange...	42	38	35	33
Median ...	39	37	33.5	24.5

One of the troublesome questions in school administration is the determination of the number of teaching hours per week which should be required of high school teachers. Motives of economy suggest an increase of

LENGTH OF TEACHING WEEK PER TEACHER BY SUBJECT IN TWENTY-FIVE HIGH SCHOOLS, CENTRAL WEST

Subject	Median Hours 60 minutes per week	Zone of Safety
Agriculture.....	25.4	23–28
Household arts.....	24.3	21–28
Commercial subjects....	24.1	23–27
English.....	23.3	20–26
Latin.....	23.2	21–26
Modern languages.....	23.2	20–26
Shop work.....	23.1	21–26
History.....	23	20–26
Music.....	22.9	15–25
Drawing.....	25.6	21–27
Science.....	22.5	20–25
Physical training.....	22	19–25

the periods, but due regard for the health of the teacher and the efficiency of instruction tend toward a lessening of the requirement. English teachers argue that the multiplicity of themes to be read necessitates more vacant periods than in subjects involving laboratory work or those in which blackboard work is a prominent feature.

The 1915 report of the superintendent of schools in Topeka, Kansas, gives the practice in twenty-five high schools in the Central West.

CHAPTER VII

EFFICIENCY OF INSTRUCTION

ONE of the functions of the supervisory officer is to determine the efficiency of instruction in the schools under his charge. For many years this was judged by the periodical written examination, which, as a method of school supervision, was as poor and wasteful a plan as could be devised. Superintendents have come to recognize its futility, and its place has been taken by the standard test which has been used with sufficiently large numbers of pupils to provide norms of a reasonable degree of accuracy.

By applying these tests in conformity with the directions accompanying them, it is possible to obtain results comparable with those secured in other cities. A still more satisfactory plan is their use to measure progress in a single school system. If a class is given the same test in September and in the following June, a comparison of the results represents the progress during the year.

In the application of standard tests as a measure of the efficiency of classroom teaching several definite rules of procedure should be followed if the results are to be at all comparable.

I. Keep the conditions of the tests constant. It is better to have them given by the same person. A slight change in the directions, or even in the inflection of the examiner's voice, will produce corresponding changes in the result.

II. Follow every detail in the directions exactly. If the tests are given by different persons, the directions should be printed and a copy given to each examiner. Results in penmanship, for instance, will vary if one class is told to copy a stanza from the board and another class is directed to write as well as it can.

III. Examiners must be clear as to the nature of the test, its purpose, and the use to be made of it.

IV. External conditions of tests for different classes should be identical. A change in the time of day, the intervention of the recess period, or interruptions from persons entering the room, will produce fluctuations in the result.

V. Be sure that the pupils understand just what they are expected to do before allowing them to begin. Use illustrations freely to make the directions clear.

VI. Have all preliminary data complete. Fill out the blanks for the subject of the test, school, grade, and the pupil's name, at the outset.

VII. Collect all possible secondary data at the time of testing. These should include the teacher's estimate of the class or of individual pupils. Be alert to note the interest of the pupils, signs of *ennui* or fatigue. Notice their reaction to the test.

VIII. Brief tests are usually preferable: they conserve the time and energy of both pupil and examiner, and little additional information is gained by prolonging them.

IX. Select simple tests. Unless testing some quality making a second visit necessary, use those that can be completed in a single visit.

X. There are two types of tests: group and individual.

The first is economical of time and must be used when returns are necessary within a short period; *e.g.*, the effect of a week's vacation. Individual tests take more time but provide data impossible to secure with the group. They also eliminate errors due to a failure to understand directions.

XI. Select tests that allow a rapid checking of results and employ an automatic device if possible. In such a test as marking out *A*'s the perforated card saves time and energy.

XII. Two measures of results are possible: the time limit and the work limit. We can allow the pupil to work a certain time and measure his efficiency in terms of ground covered (as when he is allowed to perform additions for three minutes and the number of operations is counted), or we can ask him to perform a hundred additions as quickly as possible and estimate his efficiency in terms of the time required to complete the task. In actual practice the time limit test is usually employed because of the ease of measuring. With groups this method is almost necessary, but the work limit method is psychologically preferable.

XIII. In the majority of tests a definite time limit must be imposed. No indication of value is obtained in testing accuracy in addition, if the pupils are told to add correctly but are allowed to work as long as they wish. In tests of this character the class must be held strictly to a set time. In English composition no such limitation is necessary.

XIV. So far as practical, the test should partake of the character of a regular lesson. Comments attracting attention to the unusual character of the exercise

distort the results, often to the disadvantage of the class standing.

XV. If the test is related to the teacher's work, she should be fully informed of the outcome. This is essential in securing her cordial coöperation in the future. No teacher is satisfied to spend time over work which has no apparent results.

XVI. Never test unless the use to be made of the information obtained is perfectly clear. The mere accumulation of statistics is worse than useless.

The superintendent who desires to ascertain the standing of his schools in comparison with those of other cities, or to make inter-school or inter-room comparisons in his own system, has available a wide choice from tests already developed with a reasonable degree of scientific accuracy. Those most frequently employed are penmanship, arithmetic, spelling, composition, and reading. Several attempts have been made to formulate standard tests for geography and history, but with less success than with other subjects.

Penmanship

Handwriting is one of the simplest and easiest subjects to measure. Specimens are readily gathered, little time is required to rate them, and no special knowledge or skill is necessary since a given specimen need only be moved along the standard scale until one of a corresponding degree of excellence is reached. If it is desirable to secure especially accurate returns, each specimen should be rated by several persons and the average of their judgment used; but the superintendent or principal is chiefly concerned with class averages or medians, con-

sequently there is no reason for anxiety over a variation in the rating of single papers. Experience proves that class averages are practically constant even when the rating is made by inexperienced examiners. The following table shows the average rating of twelve papers made by eleven teachers in their first attempt to use a penmanship scale.

COMPARATIVE RATING — INEXPERIENCED EXAMINERS

Paper No.	A[1]	B	C	D	E	F	G	H	I	J	K	Central Tendency
1.....	10	8	7	10	10	10	10	8	10	8	10	10
2.....	12	12	10	10	12	12	12	13	11	13	11	12
3.....	13	12	16	13	14	15	13	12	14	14	14	14
4.....	9	7	7	6	7	7	7	9	7	7	8	7
5.....	13	11	12	12	13	10	12	14	12	11	12	12
6.....	13	16	15	13	15	16	11	13	11	14	15	14
7.....	8	8	8	8	8	6	6	8	9	8	8	8
8.....	10	7	7	7	7	8	7	8	7	7	7	7
9.....	12	11	10	11	12	10	12	10	11	14	13	11
10.....	9	6	7	6	8	10	6	6	8	8	9	8
11.....	10	9	6	10	7	7	6	8	9	6	9	8
12.....	8	6	7	7	7	6	6	7	8	6	7	7
Total points	127	113	112	113	120	117	108	116	117	116	123	
Average..	10.6	9.4	9.4	9.4	10	9.7	9	9.6	9.7	9.7	10.2	

The average rating of the twelve papers by eleven teachers covers a range of from 9.00 points to 10.6, with three examiners making exactly the same average, 9.4 points. The rating of Paper No. 1 shows a central tendency of 10 points with seven teachers giving this figure. Papers seven and eight show still less variation, with eight teachers in agreement. The table as given justifies the assumption that rating by a scale is more exact than when the usual percentage method is employed.

In the application of any writing scale two elements need to be considered: speed and quality. The speed of writing may be measured rather easily by counting the number of letters written in a minute. A watch with a

[1] The examiners are indicated by the letters A, B, C, etc.

second-hand is all that is necessary for timing a class, and if several counts are made and the average employed, the result is sufficiently accurate for all practical purposes. Quality is measured by comparison with any one of the numerous published scales.

It is advisable to rate each specimen by beginning at the lower end of the scale and ascending until a quality is reached to which the sample is judged equal. After the entire group has been rated in this manner, the specimens should be re-rated, beginning at the upper limits of the scale and descending until equivalence is reached. The average of these two measurements represents the final grading.

As a practical administrative problem the value of rating penmanship papers for pupils below the fourth grade is open to serious doubt. Previous to that age children are not writing, but drawing the letters, and excellence depends solely upon painstaking care. At about the fourth grade, movement drills begin to produce results. Speed and character of line, as well as the control necessary for accurate letter formation with evenness of slant, are the objects sought, and these are what the standard scale seeks to evaluate.

As a first step in determining penmanship efficiency in any school system the frequencies of the different qualities of writing should be determined.

The following table shows a consistent improvement from the lower grades to the higher, a condition which in itself constitutes a definite evidence of the efficiency of the instruction. Instances are not lacking of a lower grade equaling or even surpassing a higher grade, but when this occurs it is certain that, by one grade or the other,

the time spent in penmanship practice is worse than wasted. Either the higher grade through lack of a definite standard or through defective teaching has been merely marking time, or the lower grade has been over-drilled. Public school instruction in penmanship is not

TYPICAL DISTRIBUTIONS OF 2486 PENMANSHIP PAPERS — THORNDIKE SCALE

Quality	Number Papers Grade V	Number Papers Grade VI	Number Papers Grade VII	Number Papers Grade VIII
6	2	2	0	0
7	5	7	1	0
8	12	26	2	0
9	27	55	8	4
10	78	169	43	10
11	181	199	102	38
12	203	175	197	67
13	151	65	202	96
14	58	19	95	82
15	15	6	23	38
16	2	0	4	15
17	0	0	0	2
Number	734	723	677	352
Average	11.7	12.0	12.4	13.1

intended to train writers of copper-plate; the aim is a legible business hand, produced with ease at a speed which can be continued indefinitely without fatigue. Over-practice is valueless, and practice in general, unless it gives definite improvement, might better be devoted to some other subject in which results can be secured.

The table shows a consistent overlapping of the grades which has been found in every study of this kind. The two pupils in Grade V, writing quality 16, are equal in

ability in this subject to the four pupils in Grade VII and the 15 pupils in Grade VIII, making the same record.

The first impression derived from a study of this overlapping of grades is that children of equal ability ought to be taught in the same group. Such a conclusion would be correct with regard to most subjects, but penmanship requires an individual rather than a group method of teaching. It follows, therefore, that uniform class ability is not so essential in writing as it would be in reading. It would seem to be a fair assumption that the variation is due to the difference in the native abilities of children and indicates the need for special treatment of individuals who fail to improve under class instruction. Pupils who have reached a satisfactory standard of attainment might well be excused from regular class drills with the understanding that so long as they maintained their proficiency no additional practice would be required. At present no definite standard has been established, although several writing supervisors excuse from class drills on the basis of a maximum varying from 14 to 16.

The superintendent who desires to compare the records of his own pupils with those obtained elsewhere should have as extensive data as can be secured. The records of pupils in various school systems are given on the following page.

A noticeable feature of this table is the close resemblance between the medians obtained in widely separated cities by different supervisors. Montclair and Elmira show high ratings, but these were the direct result of three years' application of standard scales accompanied by a vigorous campaign to secure definite improvement. The

STANDARDS OF PENMANSHIP

City	III		IV		V		VI		VII		VIII	
	Rat.	Sp.	Rat.	Sp.	Rat.	Sp.	Rat.	Sp.	Rat.	Sp.	Rat.	Sp.
Elmira, N.Y.[1]	..	..	..	..	11.7	..	12	..	12.4	..	13.1	..
Montclair, N.J.[1]	..	..	..	..	12	..	12.7	..	13.8	..	14.3	..
Salt Lake, Utah [2]	9.2	..	10.7	..	11	..	11.3	..	12.2	..	12.8	..
Butte, Mont.[2]	8	..	8.8	..	8.9	..	11.6	..	11.2	..	12.1	..
Rockford, Ill.[2]	..	..	8.5	..	8.8	..	9.8	..	10.3	..	11.1	..
Kansas City, Mo.[3]	8.2	48	8.8	60	9.4	70	9.9	80	10.6	90	..	..
4074 pupils [3]	8.2	38	8.7	47	9.3	57	9.8	65	10.4	75	10.9	83
Ashland, Oregon [4]	..	..	..	..	37	..	44	..	46	..	54	..
Cleveland, Ohio [4,5]	..	..	..	..	45	62	48	69	50	73	55	78
12 cities [4,5]	..	..	..	..	43	57	47	65	53	75	57	83
South Bend, Kan.[4,6]	40	45	40	50	50	55	50	60	60	65	60	70
56 cities [7] 34,000 pupils [7]	42	43.8	45.8	51.2	50.5	59.1	54.5	62.8	58.9	67.9	62.8	73
Freeman standards	47	48	50	56	55	65	59	72	64	80	70	90

[1] Local scale average. [2] Thorndike scale median. [3] Starch average. [4] Ayres scale average. [5] Cleveland Survey Report. [6] F. N. Freeman, Fourteenth *Year Book* of the National Society for the Study of Education, Part 1. [7] Educational Tests and Measurements, Monroe.

effectiveness of the efforts may be judged from the fact that three years earlier the Montclair ratings were: Grade V, 8.6, Grade VI, 8.6, Grade VII, 9.2, Grade VIII, 9.2. The earlier ratings illustrate the previous statement that in some instances grade averages show little improvement in efficiency as the result of a year of additional practice.

A table showing equivalency of scores for the Ayres, Freeman, and Thorndike Scales has been prepared by

RELATIVE VALUE OF SCORES ON THREE DIFFERENT SCALES

Grades	II	III	IV	V	VI	VII	VIII
Ayres	44	47	50	55	59	64	70
Freeman	17.9	18.4	19	20	20.8	22	23
Thorndike	9.36	9.75	10.13	10.76	11.34	11.89	12.66

Professor W. S. Monroe. This makes it possible to translate scores secured by one scale into terms of the other two scales.

Spelling

Ability to spell correctly is essential to every pupil, and any failure reacts unfavorably upon the reputation of the school, because business men, impatient of spelling errors in graduates, gain the idea that the whole educational structure is permeated with weakness. The responsibility for spelling failures apparently rests on the attempt to teach a large number of words with no reference to any future use that the pupil may make of them. As a result of this dispersion of effort, the drill on words that he actually uses is neglected. The exhaustive study, made by Dr. Ayres, of personal and business letters shows the comparatively small number of words actually used in correspondence. His study covered 23,629 words, and the table given indicates the frequency of their appearance.

Number of Separate Words and Their Aggregate Number of Appearances by Eighths

	Number of Separate Words	Total Number of Appearances
One eighth	3	2,954
One fourth	9	5,907
Three eighths	21	8,861
One half	43	11,815
Five eighths	99	14,768
Three fourths	226	17,721
Seven eighths	542	20,675
Eighth eighths	2001	23,629

According to Dr. Ayres' investigation one eighth of all the appearances were furnished by the three most common words *I*, *the*, and *and*.

In the face of such facts as these the absolute futility of trying to teach elementary school children the correct spelling of the ten or fifteen thousand words appearing in many spelling books is at once apparent.

To determine spelling ability for the most common thousand words in English writing, Dr. Ayres conducted an investigation covering 1,400,000 spellings by 70,000 children in 84 cities throughout the country. These 1000 words were then arranged in the form of a standard scale and furnish a means for determining the comparative spelling efficiency in any school system.[1] Several other investigations have been made sufficiently extensive to justify their use by any superintendent to measure the spelling efficiency of his own school. Two of these, *One Hundred Spelling Demons*, Dr. W. F. Jones, South Dakota

SPELLING ATTAINMENTS IN DIFFERENT CITIES, AYRES SCALE, PER CENT CORRECT

Grade	II	III	IV	V	VI	VII	VIII	Average
Springfield, Ill.[1]	70	65	70	72	68	73	75	70
Butte, Mont.[2]	86.2	81.8	78.7	84.5	75	76.2	89.4	80.3
Salt Lake City, Utah[3]	..	89.9	78.8	87.6	86.8	87.1	82.2	86
Oakland, Cal.[3]	60.4	66.7	75.9	84.7	80.2	79.7	76.3	76.5
Ashland, Ore.[4]	86	73	81	88	61	73	66	75
Topeka, Kans.	..	71.1	76.5	76.4	76.8	66.4	62	71.5
New Orleans, La.	..	65.2	76.3	79.5	79.2	77.6	74.2	74.9
Montclair, N.J.	67.6	70.4	76.9	83.1	80.3	74.1	75.3	75.3
Johnstown, Pa.	82.5	77.4	74.8	78.9	75.5	69.3	76.5	77.4
Cleveland, Ohio[5]	74	78	73	75	78	76	80	76
Des Moines, Iowa[6]	48	56	68	74	70	74	65	64.2
84 American Cities[5]	77	77	76	76	76	76	76	76

[1] Springfield Survey Report. [2] Butte Survey Report. [3] Salt Lake City Survey Report. [4] Ashland Survey Report. [5] Cleveland Survey Report. [6] Report by J. W. Studebaker.

[1] *Spelling Scale*, Leonard Ayres, Russell Sage Foundation, New York.

University, and *The Buckingham Tests*, Dr. B. R. Buckingham, New York Statistician, Department of Education, are used here.

After the relative position in spelling for any school system is determined, a complete understanding of the situation requires a distribution of the scores. Information of this character rarely appears.

PERCENTAGE DISTRIBUTION SPELLING SCORES, NEW ORLEANS, LA., AND OAKLAND, CAL., AYRES SCALE

	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0
New Orleans, La., 17,642 children.	20	21	18	13	10	7	5	3	2	1	.4
Oakland, Cal. 12,303 children.	21	22.5	18.4	13.8	8.4	6.2	4.2	2.7	1.5	.9	.4

The study made by Dr. J. B. Sears in Oakland, Cal., indicates that nationality plays a smaller part in spelling than teachers are accustomed to believe.

PERCENTAGE OF CHILDREN OF NATIVE AND FOREIGN-BORN PARENTS RECEIVING DIFFERENT STANDINGS

Children Included	Standings 100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%	Avg. St.
All of Grade VIII..	20.4	19	18.7	13.9	10.1	8.4	4.1	3.7	1.3	.3	.1	76
Foreign in Grade VIII.....	17.6	18.9	18.9	13.5	12.3	9	4.5	3.4	1.2	.5	.2	74
All of Grade V....	33.4	25.5	16.5	11.4	5.5	3.7	2	1.3	.4	.2	.1	84
Foreign in Grade V.	30.9	25.9	16.8	12.1	6.6	3.9	1.6	1.5	.7	.7	.3	82
All of Grade III...	12.6	17.8	15.3	13.5	9.8	9.1	7.7	5.7	4	2.7	1.8	66
Foreign in Grade III.....	9.2	16.9	15.6	13.6	10.2	9.8	7.9	5.9	4.3	3.8	2.8	63

The difference in the average for all groups, representing as it does from 2% to 3%, is by no means a sufficient variation to justify the all-too-common assumption that such children are a serious handicap to the schools.

The list of words compiled by Dr. F. W. Jones of South Dakota University and called by him the *One Hundred Spelling Demons of the English Language,* was used as a test by J. W. Studebaker in the Des Moines schools with the following results:

ELEMENTARY SCHOOLS, "ONE HUNDRED DEMONS"

	III	IV	V	VI	VII	VIII
No. Des Moines pupils.	833	1488	1571	1183	1101	906
Per cent words correct.	52.8	63.8	80.8	82.6	88.3	92.3
Record of 19 cities....	51.2	67.2	80.3	84.3	89.1	93

HIGH SCHOOL RECORD, "ONE HUNDRED DEMONS"

	IX	X	XI	XII	Average
Des Moines.....	93.7	94.9	95.7	97.3	95
19 cities.....	94	95.3	96	97.2	95.3

In the same report Dr. Studebaker gives the results from the use of the Buckingham scale.

BUCKINGHAM TEST ON 50 WORDS — PER CENT CORRECT

	III	IV	V	VI	VII	VIII	Average
Des Moines.....	63.3	82.8	71.7	80.4	63.5	73.2	72.4
15 cities.....	54.5	77.5	63.8	75.9	57.7	70.1	66.2

The fact that these three scales have had an application sufficiently extensive to establish standards with a reasonable degree of accuracy enables a superintendent to use all of them in his own schools, thus determining relative efficiency with less likelihood of error than would be possible with a single scale.

Arithmetic

The experimental studies of Mr. S. A. Courtis in arithmetic have been of such an extensive character as to provide standards of unusual value which, applied as they have been to thousands of children in all parts of the country, leave little doubt of the correctness of the conclusions drawn from them. Their simplicity enables teachers to use them in determining the needs and progress of their pupils and the efficiency of the methods of teaching employed; and they furnish a ready means for diagnosing the weakness of any class, besides measuring the success of the devices employed in correcting it.

The direction sheets accompanying the Courtis tests not only show the successive steps to be followed but also suggest effective charts for making the results clear even to the most casual observer. The tests include the four fundamental operations as well as exercises calculated to show reasoning power.[1] Two series, A and B, have been published, the latter being designed to correct some of the defects which experience had shown to exist in the former. The B series furnishes standards in column addition, provision for which had been overlooked before.

The chief objections to the A test are:

1. The single number combinations in fundamental operations eliminate column addition and carrying. This omission is of a distinct advantage to the lower grades.

2. In the reasoning tests, speed in solving the problems is not the only factor. The child's ability to read them

[1] Copies of these tests may be obtained from S. A. Courtis, 82 Eliot Street, Detroit, Michigan.

largely determines the result, and thus the lower grades are at a disadvantage.

3. The speed reasoning test No. 6 allows a pupil to guess at the proper sign for the answer with the likelihood of 25% of accuracy.

COURTIS STANDARDS, A SERIES, JUNE, 1913

Test	1	2	3	4	5	6		7		8	
						Att's.	R'ts.	Att's.	R'ts.	Att's.	R'ts.
Grade III	26	19	16	16	63	2.5	1.5	5	1.7	2.5	.5
" IV.....	34	25	23	23	75	3.5	1.8	7	3.5	2.9	.7
" V.....	42	31	30	30	84	4.2	2.6	9	5.2	3.1	1
" VI.....	50	38	37	37	92	4.9	3.5	11	6.7	3.4	1.4
" VII....	58	44	41	44	100	5.6	4.5	12.5	8.2	3.7	1.9
" VIII...	63	49	45	49	108	6.4	5.7	14	9.4	4	2.5
Time[1]	1	1	1	1	1	6	6	12	12	6	6

4. The use of the same tests for all grades is likely to prove too easy for the older pupils and too difficult for the younger. However, the use of a common test for all classes shows whether or not the grades develop progressively from the lowest to the highest in a uniform curve.

The success of two cities in meeting these standards set by Mr. Courtis is shown in the following tables.

On the basis of the knowledge gained from the use of Series A, the B test was devised and has practically supplanted the earlier one. In the addition test the figures are so chosen that all the fundamental combinations are employed. The examples used show the child's ability in column addition and in carrying, as well as in speed and accuracy.

[1] Time allowance in minutes.

RESULTS OF COURTIS TESTS, SERIES A, IN TWO CITIES

Test	1	2	3	4	5	6 Att's.	6 R'ts.	7 Att's.	7 R'ts.	8 Att's.	8 R'ts.
Boise, Idaho											
Grade III.....	33	24	21	21	79	..	..	..	..	..	..
" IV.....	43	34	34	32	92	4.2	2.5	7.9	5.1	..	..
" V.....	46	38	37	37	97	4.2	3.2	8.9	6.5	3.5	1.2
" VI.....	53	44	42	44	106	5.3	4.7	10.3	8.8	3.7	2.3
" VII.....	63	50	51	51	117	6.3	5.8	12	8.8	4.3	3.3
" VIII.....	65	50	52	53	122	7.4	7	13.4	10.2	5.2	4.1
Montclair, N.J.											
Grade IV.....	35	26	22	22	77	3.7	2.6	7.4	4	3	1
" V.....	46	36	33	28	90	4.6	3.9	9.7	6.5	3.5	1.7
" VI.....	52	40	36	37	100	5.6	4.6	12.1	8.7	4.2	2
" VII.....	56	47	39	39	105	6	5.9	13.1	10	4.5	3.1
" VIII.....	63	47	39	44	112	6.1	5.5	15.1	10.3	4.5	3.1

With reference to the standards which he has proposed Courtis says:

"The speeds set as standards are approximately the average speeds at which the children of the different grades have been found to work when tested at the end of the year, when for any one grade a random selection of 5000 scores from children in schools of all types and kinds is used as a basis of judgment.

"Standard accuracy is *perfect* work, 100 per cent. This is a tentative standard only, as there is available very little information in regard to the factors that determine accuracy and the effects of more efficient training.

"At present in addition and multiplication it is only very exceptional work in which the median rises above 80 per cent accuracy, while in subtraction and division the limiting level is 90 per cent.

"Standard speeds are not likely to change greatly; standard accuracy is surely destined to approach much more nearly 100 per cent than present work would indicate. Standard scores are not only goals to be reached; they are *limits not to be exceeded.* It seems as foolish to *overtrain* a child as to undertrain him. All direct drill work should, *in the judgment of the writer,* be discontinued once the individual has reached standard levels. If his abilities develop further through incidental training, well and good, but the superintendent who, by repeated raising of standards, forces teachers and pupils to spend each

COURTIS STANDARD SCORES SERIES B (I)

	Addition				Subtraction			
Grade	Speed		Accuracy		Speed		Accuracy	
	M	S	M	S	M	S	M	S
III	6.3	4	41	100	5.6	5	49	100
IV	7.4	6	64	100	7.4	7	80	100
V	8.6	8	70	100	9.	9	83	100
VI	9.8	10	73	100	10.3	11	85	100
VII	10.9	11	75	100	11.6	12	86	100
VIII	11.6	12	76	100	12.9	13	87	100
	Multiplication				Division			
Grade	Speed		Accuracy		Speed		Accuracy	
	M	S	M	S	M	S	M	S
III	.8	0	—	—	.6	0	—	—
IV	6.2	6	67	100	4.6	4	57	100
V	7.5	8	75	100	6.1	6	77	100
VI	9.1	9	78	100	8.2	8	87	100
VII	10.2	10	80	100	9.6	10	90	100
VIII	11.5	11	81	100	10.7	11	91	100

Key *M* — Adjusted Median
S — Score Adopted as Standard

(1) Courtis, S. A. Third, Fourth, and Fifth Annual Accounting, 82 Eliot Street, Detroit, Michigan.

year a larger percentage of time and effort upon the mere mechanical skills, makes as serious a mistake as the superintendent who is too lax in his standards."

In establishing median speed and accuracy Mr. Courtis employed thousands of individual scores from tests given in May and June, 1915 and 1916, to approximately equal numbers of classes in large and small school systems.

MEDIAN STATE SCORES — COURTIS TESTS — SERIES B

	Addition		Subtraction		Multiplication		Division	
	Speed	Acc.	Speed	Acc.	Speed	Acc.	Speed	Acc.
FOURTH GRADE								
Indiana	..	..	..	..	..	..	..	..
Kansas	6.4	51	6.5	63	5.2	55	3.8	40
Iowa	6.2	56	6.8	74	5.8	61	4.2	59
Minnesota	5.7	52	4.8	55	5.2	56	5.3	38
FIFTH GRADE								
Kansas	6.8	63	7.4	78	6.6	69	4.7	67
Indiana	7.2	59	7.5	71	6	61	5	65
Iowa	7.4	62	8.2	80	7	70	5.5	74
Minnesota	6.9	60	7.6	73	6.5	67	4.4	67
SIXTH GRADE								
Kansas	6.9	65	8.8	82	8.1	74	6.4	82
Indiana	8.3	64	8.7	77	7.5	68	6.1	79
Iowa	8.5	67	9.7	83	8.6	76	7	83
Minnesota	7.7	62	8.4	76	7.6	71	5.6	78
SEVENTH GRADE								
Kansas	7.7	67	10.2	83	9.5	75	8.4	87
Indiana	8.9	64	9.9	80	8.5	71	7.8	84
Iowa	9.1	68	10.7	84	9.9	78	8.5	88
Minnesota	8.2	65	9.8	79	8.7	75	6.7	83
EIGHTH GRADE								
Kansas	9.8	78	11.7	85	10.2	81	9.8	88
Indiana	9.5	67	10.9	82	9.9	74	9.7	87
Iowa	10	72	12	86	11.5	81	10.8	91
Minnesota	9.2	69	11.2	86	10.7	81	8.6	89

In the bulletin containing the Second and Third Annual Reports of the Bureau of Educational Measurements and Standards of the State Normal School at Emporia, Kansas, Dr. Walter S. Monroe makes a detailed report giving the median scores for cities in Kansas, Indiana, Iowa, and Minnesota. The Kansas medians represent 25 cities in that state, the Iowa medians 52 cities, the Indiana medians 22 cities, and the Minnesota medians 16 cities. All tests were given in May, 1916. In these tables, "speed" means the number of examples done in the specified time, and "accuracy" means the per cent of the examples in which the correct answer was obtained.

The Butte Survey Report gives the median scores made by pupils in Detroit, Boston, a group of smaller cities, and Butte, in working the same examples in the same amount of time. The "Rights" only are given.

MEDIAN SCORES, SERIES B, COURTIS TESTS

Grades	V	VI	VII	VIII
Addition				
Detroit (1315 pupils)	3.9	4.6	5.4	6.7
Boston (20,441 pupils)	3.7	4.9	5.6	7.8
Other cities [1] (3618 pupils)	3.9	4.4	4.7	5.6
Butte (573 pupils)	2.9	3.4	3.8	5.3
Salt Lake City [1]	4.1	6.4	6.9	8.5
Rockford, Ill.	3.5	4.5	5.8	6.3
Santa Clara Co., Cal.	1.8	2.3	3.5	4.3
Subtraction				
Detroit	5.5	6.2	7.3	9.5
Boston	4.9	6.3	6.9	8.6
Other cities	4.5	6.1	7.8	8.4
Butte	5.5	5.8	7.1	9.8
Salt Lake	5.2	7.8	8.8	9.8
Rockford	4.3	5.7	7.6	8.6
Santa Clara	2.8	3.5	5.2	6.8

[1] Salt Lake City Survey Report.

MEDIAN SCORES, SERIES B, COURTIS TESTS (*Continued*)

Grades	V	VI	VII	VIII
Multiplication				
Detroit	3.8	4.8	6	7.5
Boston	3.3	4.8	5.1	6.5
Other cities	2.6	4.5	5.2	6.4
Butte	4.1	5	6.5	8.1
Salt Lake	4.3	5.3	7.1	8.3
Rockford	3.6	4.5	6.1	6.9
Santa Clara	1.2	2.5	3.4	4.9
Division				
Detroit	2.7	4.4	7.1	8.8
Boston	2	3.3	5.1	6.9
Other cities	2.3	4.3	5.8	6.3
Butte	3.6	4.3	7.2	10.2
Salt Lake	3	5.5	7.7	9.5
Rockford	1.9	3.4	4.9	6.9
Santa Clara	.5	1.6	3.2	4.5

When Series B is used and tests in reasoning seem advisable, the Stone tests are sometimes employed. The standard formulated by Dr. Stone and those reported in the Salt Lake Survey and the Butte Survey Reports are as follows:

STONE REASONING TESTS[1]

Grades	V	VI	VII	VIII
Stone Standard				
26 cities	..	5.5	..	..
Salt Lake City, Utah	3.7	6.4	8.6	10.5
Butte, Mont.	2.2	3.9	5.8	7.7
La Porte, Ind.	3.4	4.6	8.1	8.6
Brookline, Mass.[2]	4	6.2	..	..
Starch Standards	7.8	9.4	11	..
Boston, 1916	..	4	6.4	..

[1] Arithmetical Abilities, Dr. C. W. Stone, Teachers College, N. Y.
[2] Brookline Survey Report.

The possibilities of the standard test for measuring the arithmetical skill of pupils are by no means exhausted by these tests. It remains to devise equally efficient measures in fractions, decimals, percentage, and in problems of everyday life.

Composition

In the field of English composition appears a greater diversity in the quality of the work than in almost any other subject. Teachers have recognized the fundamental importance to the child of facility of expression in the mother tongue and have devoted their best efforts to developing in the pupils the power to state their thoughts accurately and effectively. Much of the time spent in this way has been wasted because definiteness in aim was lacking. Writing on subjects that have no vital connection with the child's experience is well-nigh valueless. It is only when the writing has back of it a clear-cut purpose, that results are obtained commensurate with the expenditure of effort.

Realizing that some method for estimating the quality of English composition is an essential step in its improvement, Dr. J. M. Rice seized upon the reproduction story as a satisfactory measure. The details of the plan were published in the *Forum*, October and December, 1903, and later in his book, *Scientific Management in Education*. The scheme as carried out by Dr. Rice consists of reading to the pupils the story of Pestalozzi's school at Stanz, after which they reproduce the story in their own words. The scale is made of five specimens of the reproduced story, to which arbitrary values are assigned. Any set

of papers is graded by distributing them into five groups corresponding in literary value to the five papers of the scale. Experience proves that this may be done with no greater error than would occur in marking a set of papers in an exact science such as arithmetic. The test included 8300 children in nine different cities with the following results:

COMPOSITION RESULTS, RICE TEST

Grade		IV	V	VI	VII	VIII	%
City	School	Class Average	Class Average	Class Average	Class Average	Class Average	Amer. Pupils
I	1	12.5	23.7	36.8	46.5	70	81
II	1	9.9	13.1	33.8	42.9	76.2	71
II	2	10.6	20.9	25.4	38.8	73.8	83
III	1	13.4	17.7	31.8	49.4	56.6	28
IV	1	14.3	22.2	35.4	43.4	56	74
V	1	15.5	16	31.2	44.5	51.7	85
II	3	..	22.5	28.7	34.8	56	..
II	4	6.5	7	26.8	29.7	51.1	64
II	5	5.6	15.7	23.3	39.2	41.7	6
I	2	11.5	14.3	30.5	25.7	40.5	74
V	2	2.5	8.7	19.9	23.8	53.2	56
V	3	7.5	5.1	19.5	24.4	46.6	75
V	4	..	5.2	15.4	29.8	42.5	15
VI	1	..	4.8	26.8	23.2	35	85
III	2	2	6.8	21.2	25.1	35.6	71
VII	1	2.8	9.1	16.5	18	45.7	71
III	3	1.7	9.5	14.8	26.5	36.5	34
VIII	1	6	7.7	12.2	27	38.7	64
IV	2	5.6	13.7	16.7	24.2	35.5	58
IX	1	5.7	11.6	16.1	26.1	32	67
IX	2	4.5	7.8	12.7	21	29.6	43
VII	2	..	5.7	15.5	15.7	29.4	37
General average		6.8	12.2	23.2	30.6	47	
Rice Standard	10	15	25	37.5	50		

While a scale of this character may lack the scientific precision of later standard scales, a somewhat extended use of this method of measuring composition justifies the conclusion that it furnishes a simple and reasonably exact measure of the quality of composition in any school system. The writer is so thoroughly convinced of this fact that he has used the same plan in the lower grades with excellent results.

Some of the stories given the third and fourth grades are: The Dog and his Shadow, The Two Goats, Dick and his Cat, The Grasshopper and the Ant, The Cat and the Monkey. The plan followed is that used by Dr. Rice. Five standard papers, numbered from one to five in the order of their excellence, constitute the scale. To read a set of papers, placing each in a pile representing the proper standard, is a comparatively simple matter. The system of estimating rests on the fact that any written composition makes a definite impression as a whole. Of a picture we say instinctively that it is good, or passable, or bad, without stopping to analyze it as to proportion, perspective, color, or any other detail. Until one has actually tried the experiment with thousands of papers, it is difficult to believe that English work may be treated in the same way — judged by a single impression of the entire paper. It is the established fact that a theme may be so judged as to render detailed scrutiny unnecessary, and thus a great saving of time in rating papers may be effected.

The scheme of rating is best illustrated by giving an original story and a representative paper in each of the five groups; "5" is given only to a paper which, besides being correct in every way, shows a touch of originality in treatment. There are few "5's" in an entire city.

GRADES III AND IV

The Cat and the Monkey

(Original)

A cat and a monkey saw some nuts roasting in a fire. The monkey told the cat to pull them out with her paw. She got one out, but the fire hurt her.

The monkey told her how clever she was, so she kept on trying till all the nuts were pulled out. Then she turned around to show the monkey how her paw was burned, and found him eating the last nut.

Standard Five

A cat and a monkey were sitting in front of a fireplace where some nuts were roasting. "Put your paw in and pull some of those nuts out," said the monkey. Without thinking of anything but the nut, the cat did so and then cried out as the fire burned her. "Oh, never mind a little pain," said the monkey. "You are very clever. Try another." So the cat kept on pulling out one after another till she had them all. Then she turned around to show the monkey her poor, burned paw and found the greedy animal eating the last nut.

Standard Four

A cat and a monkey saw some nuts roasting in the ashes. The monkey said, "Put your paw in and pull them out." The cat did so, and got one out. The monkey told her how clever she was. She got them all out, and turned around to show the monkey how she had burned her paw. She saw the monkey eating the last nut.

Standard Three

Once there was a cat and a monkey, and they saw some nuts roasting in a fire. The monkey said, "if you will put your paw in the fire we will have some nuts, to eat. So the cat did so, when the cat was getting the last nut, the monkey had eat all the nuts up. And told her how clever she was.

Standard Two

One day a cat and a monkey saw some nuts roasting in the fire. So he said to the cat. She sould pout in her parr and take out the nuts. So she pout in her parr and took out one nut. And she brun her parw. The monkey said she was doing well. So she went on and on until she got all the nuts out. And then she show him her parw how brun her.

Standard One

The cat was getting nut out of over was roasting. The cat was clever and was geting nut of over and the cat pas got brun. And he care get nut of the over. At at he got the last one the cat shone the monkey his brun pas.

It is not assumed that the scale as suggested is scientifically exact. A large number of expert judgments or an extensive application of the scale is necessary to determine exact intervals; but nevertheless it does provide a simple means of estimating roughly the relative proficiency of any class or its progress from the beginning to the close of the year. The results obtained by the use of the test are as follows:

REPRODUCTION — THE CAT AND THE MONKEY: GRADE III

City	Standard	City Average	No. of Classes	No. above Standard	No. below Standard	Highest Record	Lowest Record
Brockton, Mass...	12	8.6	31	8	23	17	.9
Elmira, N. Y.....	12	14.7	16	11	5	38	3
Montclair, N.J. ..	12	15.7	12	8	4	30.5	1.8
			GRADE IV				
Brockton, Mass...	25	23	30	10	16	38.3	11.2
Elmira, N. Y.....	25	31	17	15	3	53	13
Montclair, N.J. ..	25	29.7	11	8	3	47.2	15.9

The Hillegas and the Harvard-Newton Scale have been extensively employed, and the results of their application in a few cities follow. Copies of the Hillegas Scale may be obtained from Teachers' College, New York City, and of the Harvard-Newton Scale from Harvard University Press, Cambridge, Mass.

RECORDS, HILLEGAS SCALE

City	Grades	IV	V	VI	VII	VIII
Butte, Mont.[1]		2.34	2.87	3.40	3.75	4.11
Salt Lake City, Utah[2]		2.9	3.1	3.8	4.4	5.4
Maryland and N. Y. City[2]		..	5.15	..	5.7 to 7	..
Delaware Co., Ohio[2]		..	..	..	..	3.94
Delaware City[2]		..	..	..	..	5.27
La Porte, Ind.[3]		4.1	4.4	5	5.8	6.8

[1] Butte Survey Report. [2] Salt Lake City Survey Report. [3] Indiana University Bulletin.

DISTRIBUTION OF COMPOSITION SCORES BY GRADES — HILLEGAS SCALE[1]

	Grades IV	V	VI	VII	VIII	
Rated at 0	3	1	..	2	1	
" 1.83	79	46	31	17	9	
" 2.60	66	86	67	63	32	
" 3.69	30	49	65	84	39	
" 4.74	3	18	35	68	43	
" 5.85	..	1	23	19	22	
" 6.75	..	..	6	7	6	
" 7.72	..	..	..	2	2	
Total papers	181	201	227	262	154	1025
Median score	2.34	2.87	3.40	3.75	4.11	

Comparatively few statistics of the Harvard-Newton Composition tests are available, a fact which indicates that teachers have found the scale too difficult to use.

[1] Butte Survey Report.

The median records from four cities are given in the following table:

COMPOSITION ACHIEVEMENTS — HARVARD-NEWTON SCALE

Grades	VI	VII	VIII
Brookline, Mass.	61	..	70
Newton, Mass.	..	75	75
Bloomington, Ind.	..	61	67
Port Townsend, Wash.	..	53	58

READING

In estimating the child's mastery of reading, three elements must be considered: First, the degree of comprehension of the material read; second, the speed of reading; third, the quality of the oral reading, which includes accuracy, inflection, etc. The opinion of the school respecting the comparative importance of these three elements has changed radically during the past few years. There was a time when the elocutionary side of reading was stressed as of supreme value; but as a practical art reading aloud is of little importance in the life of any person. It ranks rather as an accomplishment, while ability to get the thought from the printed page is absolutely essential to the pupil's success in his school work. Speed of reading is essential, since the weight of available evidence shows that speed and comprehension are closely correlated. These two elements are comparatively easy to measure, especially the element of speed. Since both of them are determined largely by the child's vocabulary it follows logically that tests of vocabulary, speed, and comprehension will serve as an adequate measure of a pupil's reading ability.

One of the recent comprehension tests is that of F. J. Kelly, of Emporia, Kansas, which consists of short paragraphs containing questions to be answered or directions to be followed. A time limit is fixed, and the degree of the child's comprehension is indicated by the accuracy with which the directions are followed or the questions answered in the given time.

The median attainments for over 100,000 children in different sections of the country are given in the Second and Third Annual Reports of the Bureau of Educational Measurements and Standards, Emporia, Kansas, Dr. Walter S. Monroe. They furnish a standard for the guidance of schools using the test.

MEDIAN SCORES — KANSAS SILENT READING TEST

Grades	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Kansas.....	4.9	9	13.4	13.7	16.1	20.1	24.3	25.2	26.5	28.4
Iowa.....	6.2	9.5	14.6	14.8	17.7	20.6				
S. Atlantic States.....	6	9.2	13.9	11.6	14.5	15.8	21.8	20.7	25	39.3
N. Atlantic States.....	5.3	9.6	12.9	13.6	16.7	17.8	24.8	28.9	22.8	27
S.Central States	4.7	8.4	12.3	11.8	15.4	19.2	22.4	24.5	25	29.2
N.CentralStates	5.1	9.3	13.1	13.6	16.2	18.2	21.5	25.7	26.5	31.8
Western States.	6.1	10.6	14.4	15	18	20.6	23.5	26	26.4	31.4
Total.....	5.3	9.5	13.2	13.9	16.2	19.2	22.9	25.6	26.5	29.7

Similar records from four single cities provide a check upon the more extensive study given above.

MEDIAN SCORE — KANSAS SILENT READING TEST

Grades	III	IV	V	VI	VII	VIII
Kansas City, Mo.....	6	9.9	13.7	13.4	16.5	18.8
New Orleans, La.....	4.8	8	12	11.3	15	19.1
Montclair, N.J.	10.4	11	..	.	18.4	
Rockford, Ill.....	4.5	10.5	13.1	12.2	19.2	19

The Kelly tests are easy to administer, and the scoring is a very simple matter. It is by no means certain that ability in reading is the only element involved. Some of the steps in the scale are virtually puzzles. Others involve an application of arithmetic which troubles some children.

In the Starch tests two elements are taken into consideration: speed and comprehension. Reading selections suitable to the capacity of the children are distributed. At a given signal they begin to read silently and are allowed to continue for exactly thirty seconds. At the end of that time they turn the blanks and reproduce as exactly as they can what they have read. Speed is measured by counting the number of words read in a second, and comprehension by the number of words reproduced which correctly give the thought. Dr. Starch suggests that a considerable amount of time may be saved in scoring comprehension by counting the actual number of words written by the class and reducing the average by seven per cent instead of rejecting the extraneous words introduced by individual pupils. The standard of attainment for this test is based upon the record of over 6000 pupils in 27 schools in different cities.

SPEED AND COMPREHENSION — STARCH TESTS [1]

Grade	I	II	III	IV	V	VI	VII	VIII
Speed (words per second)	1.5	1.8	2.1	2.4	2.8	3.2	3.6	4
Comprehension (words written)	15	20	24	28	33	38	45	50

[1] *Educational Measurements*, Daniel Starch, The Macmillan Company.

The Salt Lake City Survey Report gives the results obtained by using the Courtis tests designed to show the rate of silent reading and ability to remember what is read. The first test consisted of a story, "Bessie's Adventures." The children were asked to read silently with as great speed and as great care as possible. Exactly one minute was allowed, and at the expiration of this time the pupils indicated the last word read. The number of words read in the minute were then counted and constituted the score. In the second test no time limit was enforced. The children were given the same story and requested to check from memory the one word, out of three enclosed in a parenthesis, which was used in the original story. These three-word parentheses were scattered freely through the story and were intended to show the pupil's memory of the exact words read. In the first story, for instance, the clause "Before the frightened little girl could decide what to do" occurred. This appeared in the second story as "Before the (frightened terrified poor) little girl could (decide think know) what to do." A child making an accurate score would check "frightened" in the first parenthesis and "decide" in the second parenthesis. The total number of words checked correctly represents the pupil's score in ability to recall correctly what has been read.

NUMBER WORDS READ PER MINUTE — COURTIS TESTS

Grade	Courtis Standard	Salt Lake City Median
VIII	200	209
VII	185	219
VI	160	212
V	130	191

MEMORY TEST MEDIANS [1]

Grade	Points Read	Points Correct	Per Cent Correct
VIII	22.7	18	79.3
VII	23.9	17.4	72.8
VI	22.7	17.5	77.1
V	20.8	15.5	74

Tests of the character indicated in this chapter will not take the place of helpful, constructive supervision: their proper function is to determine how much progress is being made from year to year by the schools as a whole, to reveal the success or failure of the methods employed, and to furnish a basis for any change in the fundamental policy of the school system. When administered in this manner they are more valuable than the old type of examination and should meet with the hearty coöperation of the classroom teacher.

One of the factors in silent reading is the ability to associate the printed word with its meaning. The visual vocabulary scale devised by Professor E. L. Thorndike, of Teachers' College, furnishes a test of this power. Details for the method of scoring and use of the scale are given in Teachers' College *Record* for September, 1914.

MEDIAN SCORES — VISUAL VOCABULARY TESTS

Grade	Total for Nine Cities [2]		Indiana Eighteen Cities [3]	
	No. Pupils	Median	No. Pupils	Median
III	...	...	1650	4
IV	385	4.43	2095	5.26
V	355	5.30	2028	6
VI	411	6.18	1860	6.66
VII	354	7	1625	7.29
VIII	168	7.90	1313	7.91

[1] Salt Lake City Survey Report.

[2] Bureau of Educational Measurements and Standards, Emporia, Kansas.

[3] Indiana University Study, Vol. IV. M. E. Haggerty.

The Thorndike Scale Alpha is designed to measure a child's ability to understand the meaning of sentences, and is determined by the accuracy with which specific questions are answered after the reading of an assigned paragraph. A complete description of the test appears in Teachers' College *Record*, November, 1915, and January, 1916.

The median scores for the pupils in eighteen cities in Indiana are reported by Professor M. E. Haggerty, Indiana University.

MEDIAN SCORES IN UNDERSTANDING OF SENTENCES BY THE THORNDIKE SCALE ALPHA [1]

Grades	III	IV	V	VI	VII	VIII
Median	5.48	6.56	7.56	8.46	8.72	9
Number of pupils	1650	2905	2028	1860	1625	1313

[1] *Educational Tests and Measurements*, Walter S. Monroe, Houghton Mifflin Company.

CHAPTER VIII

COURSE OF STUDY AND TIME SCHEDULE

THE content of the curriculum, unlike many of the other efficiency factors of the school system, is to a large extent dependent on individual judgment and opinion. It is true that certain fundamental principles may be formulated which meet with general acceptance in the educational world, but if these principles are challenged by critics no conclusive evidence can be produced in their defense.

Even when it is possible to justify beyond question the curriculum used for one community at one time, there is no assurance that a similar course of study would meet the needs of another community; or even of the same community at another stage in its development. Social demands and conditions are in a constant state of change, and the curriculum must change accordingly. What then are the principles by which the superintendent may check his own course of study to determine if it reaches the standard generally accepted in the best schools?

I. The fundamental aims and purposes must be so clear that every teacher is working definitely to realize them.

II. The course of study must contain all of the elements necessary to produce the desired results.

III. Adequate provision must be made for systematic training of all types of children. This includes the hand-minded as well as the book-minded, subnormal as well as

precocious, and those who are handicapped by physical defects.

IV. The child and not the subject matter must be the center of attention. This involves — (*a*) A study of the pupils, to determine the exact type of instruction suited to their individual needs and capacities. (*b*) A study of the community, to learn its needs in order to present to the child the fullest opportunity of preparing himself to gain a livelihood and to arouse him to a sense of his obligation to his fellows as a social being.

V. The course of study should furnish the tools of education; reading, writing, arithmetic, language, geography, and history including civics. There should be a clear recognition of the fact that the first four are tools only. This recognition causes the elimination of obsolete and useless subject matter.

VI. The curriculum should be alive, bringing the pupil into contact with things of his daily experience, because such subject matter appeals to him directly as worth while.

VII. Careful consideration should be given to the length of time the pupil will continue to attend school, and subjects should be so arranged that they provide those who leave at the close of the compulsory attendance period with a reasonable preparation for efficient citizenship.

VIII. This organization of the curriculum will lead naturally from the general knowledge essential to all to the special knowledge required by the few.

IX. The well-developed course of study involves attention to reasonable correlations. The efficient teaching of history, for instance, necessitates the proper location of

the region where the events occurred, and good English is an integral part of every recitation.

X. Teachers should be left free to exercise their originality and initiative so far as is consistent with the fundamental purposes of the curriculum.

XI. An ideal curriculum is one which induces the habit of self-expression and self-criticism. It involves the weighing of relative values to determine those which are really worth while.

XII. Knowledge of and ability to use the mother tongue should be one of the results derived from a well-balanced course of study.

These general purposes of the curriculum cannot be appraised in the same definite manner as is possible in measuring the achievements of pupils; the extent to which they are realized must be determined largely by the exercise of good judgment on the part of the supervisory force. Nevertheless, the amount of time assigned to the different subjects will help to indicate to the teacher their relative value; consequently the experience of the best schools is suggestive in determining the time allowance for each subject if the desired ends are to be reached.

Reading and Literature

The Fourteenth Year Book of the National Society for the Study of Education gives the average time distribution by subjects and grades in fifty representative cities.

The wise use of the time assigned to reading involves a recognition of the chief aim of school reading, which is — to put the child in possession of the essential tools of an education. It includes the commonly accepted purposes

of thought-getting, expressive oral reading, enlargement of vocabulary, word study, understanding of expressions and allusions, acquaintance with leading authors, etc. The general school tendency is to place undue emphasis upon the manner of reading, to the neglect of what the child reads. Books that are valuable for general educational purposes may also develop power in the mechanics of reading and have the added advantage of enlisting the interest

TIME GIVEN TO READING AND LITERATURE IN FIFTY CITIES

Grade	Hours per Year	Per Cent of Grade Time
I	266	31
II	235	26
III	188	21
IV	153	16
V	126	13
VI	117	12
VII	98	10
VIII	97	10

of the child, leading him to read for recreation and for the culture that comes from familiarity with newspapers, books, and magazines. Oral reading is becoming of steadily diminishing importance to adults: rapid and silent reading for content has taken its place. The school must change its practice to conform to this demand, giving the child abundant practice in reading for thought, and for the sake of developing the power of comprehension which he will later need. This may be provided by a liberal use of supplementary readers. No single type of book should be allowed to monopolize the program: the greater the variety the wider will be the social horizon. Literature, history, travel, biography, science, and social relations

make up the range of adult interests, and the formation of the habit of reading along all these lines is important to children. To meet the need fifteen or twenty sets of supplementary readers should be available for every grade. Only by adequate provision for practice can the necessary skill in rapid reading be developed.

Spelling

In this subject the aim is not to teach the child the correct spelling of a large number of words, but rather to make him absolute master of those that he will actually use. Ability to spell unusual words while failing on those of every-day intercourse is misdirected effort, and is responsible to a large degree for the criticism directed against the public school by business men whose patience is often sorely tried by the spelling deficiencies of its graduates. Children and adults alike need to spell the words they write and only these. Extensive tests have established the truth that the list of such words is comparatively small and that the time at the disposal of the teacher is sufficient for their mastery. The child or the adult who has acquired the habit of watchfulness over his spelling, consulting the dictionary when in doubt, necessarily becomes a good speller; the real difficulty comes from failure to perceive that the word is misspelled. The person who knows that he knows, or knows that he does not know, is sure of the ultimate mastery of the spelling intricacies of the English language. The investigations made by Dr. J. M. Rice show that an excessive increase in the amount of time allotted to spelling tends to defeat the desired end.

SPELLING TIME ALLOWANCE IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Time
I	54	6.3
II	66	7.3
III	73	8
IV	67	6.9
V	61	6.3
VI	58	5.9
VII	52	5.3
VIII	51	5.1

Spelling practice should continue until it has developed absolute accuracy. In some instances this will mean its persistence even through the high school course. If teachers consistently refuse to accept written work containing misspelled words, students will be forced to develop the habit of watchfulness. Those who do not need the drill should be excused from spelling exercises, thus avoiding the waste of time involved by imposing the burden upon all because of the failure of a few.

HANDWRITING

Methods of instruction and the insistent demand that a certain fixed standard of attainment be reached are the essential factors to be considered in this subject.

Many supervisors of penmanship question whether formal lessons in grade one develop skill in writing, although the value to the teacher as a form of busy-work is a different matter.

[1] Fourteenth Year Book.

TIME ALLOWANCE HANDWRITING IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Grade Time
I	50	6.7
II	60	6.7
III	52	5.7
IV	53	5.5
V	50	5.1
VI	47	4.8
VII	39	3.9
VIII	37	3.7

LANGUAGE, COMPOSITION, AND GRAMMAR

No subject in the curriculum is of more practical importance to the pupil than mastery of his mother tongue. Facility in expression is rather a matter of practice than of memorizing rules, consequently technical grammar as such should receive little attention in the lower grades. Conscious and unconscious imitation of good forms should be the chief reliance of the school in developing power to use English accurately and effectively.

TIME ALLOWANCE FOR ENGLISH IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Total Time
I	75	8.6
II	79	8.7
III	94	10.3
IV	106	10.9
V	116	12
VI	118	12.2
VII	134	13.7
VIII	142	14.1

[1] Fourteenth Year Book.

Oral and written expression, with constant watchfulness on the part of pupils against their habitual errors, must be the basis of the work. Isolation of the composition exercise is a wasteful method of procedure. The more closely it can be correlated with other lessons the better the results.

Mathematics

That all pupils should be trained until they possess reasonable skill and accuracy in the fundamental operations of arithmetic is granted by everyone, but beyond this point there are radical differences of opinion. There is a growing tendency to hold the subject in less esteem

Time Allowance for Arithmetic in Fifty Cities [1]

Grade	Hours per Year	Per Cent of Total Time
I	60	6.9
II	96	10.7
III	131	14.4
IV	149	15.4
V	144	14.9
VI	146	15
VII	140	14.4
VIII	142	14.1

than formerly. Puzzle problems are no longer included in our best textbooks. We need not so much the skill to solve problems of this character as the ability to think in numbers. Expertness in the manipulation of figures and power to apply them to the solution of problems within the experience of the pupil should be the aim of the school. This requires enough drill to give freedom

[1] Fourteenth Year Book.

from effort, so that, figure manipulation being relegated by habit to the lower brain centers, the child can use the higher centers for the application of the figures to the solution of the problem.

History

TIME ALLOWANCE IN HISTORY IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Total Time
I	27	3.1
II	31	3.4
III	35	3.8
IV	57	5.8
V	67	6.9
VI	71	7.3
VII	91	9.2
VIII	117	11.6

Knowledge of history is essential to an understanding of the complicated social problems of a democracy, the method of solving them being developed only from a study of the past. To memorize facts furnishes no help toward their understanding, although facts are an essential basis for deductions. In the lower grades biographies of men who participated in the great events of history will furnish the necessary background for a later study of the events, which should be treated topically, with an abundance of reading to show the relation between present and earlier conditions. If the subject is presented as a series of problems for pupils to solve, the necessary application of information obtained from required reading will change history from a memory subject to a means of social analysis.

[1] Fourteenth Year Book.

The problem method of attack may also be applied to a study of civic questions, viz., community health and sanitation, city water supply, garbage disposal, street cleaning, the work of city officials, and kindred topics.

GEOGRAPHY

TIME ALLOWANCE FOR GEOGRAPHY IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Total Time
I	16	1.8
II	7	.8
III	50	5.4
IV	83	8.5
V	102	11.2
VI	107	11
VII	98	9.9
VIII	76	7.5

Geography, in the best school systems, is no longer taught for the sake of enabling a pupil to locate natural and political divisions, which mean little or nothing to him and are soon forgotten. Like history, it must be humanized and socialized if it is to justify the time given to it. Industries, commerce, agriculture, and modes of living are the centers around which the work is grouped. Children are trained to take an attitude of intelligent interest in the world about them and in the relations between their own country and other peoples of the world. Cause and effect play an important part in this study. Geographical readings, maps, globes, pictures, diagrams, museum materials, etc., are the means employed in making the relationship real.

[1] Fourteenth Year Book.

Drawing and Applied Art

Drawing is an effective medium for conveying ideas, in some instances an even more effective mode of expression than oral or written speech. The administration of the course calls for an understanding of the principles

Time Allowance in Drawing and Applied Art in Fifty Cities[1]

Grade	Hours per Year	Per Cent of Total Time
I	98	11.3
II	54	6
III	56	6.2
IV	53	5.5
V	50	5.2
VI	50	5.1
VII	50	5
VIII	40	4.9

of graphic art through their application to constructive activities, and mere copying from books or from board drawings made by teachers will not accomplish this purpose; but close coöperation between drawing and manual training teachers provides for this vital application of drawing theory to concrete situations.

Industrial Arts

No argument is needed to justify teaching domestic science to girls, since the majority of them are sure to use their school training in homes of their own. Granted that this is the reason for teaching the subject, it follows that the work should be of as practical a nature as possible. Every opportunity should be sought to make the school

[1] Fourteenth Year Book.

kitchen function in useful projects. Preparing and serving meals to groups of officials, cooking food to be used in the lunch room, and filling orders from school patrons are some of the ways open to the domestic science teacher for disposing of the products. Fractional cooking should be avoided so far as possible, because of its failure to reproduce home conditions. The only limitation upon cooking in family quantities is that imposed by the market for the food cooked.

TIME ALLOWANCE FOR MANUAL TRAINING AND DOMESTIC SCIENCE IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Total Time
I	42	4.8
II	47	5.1
III	40	4.5
IV	45	4.6
V	50	5.2
VI	57	5.8
VII	72	7.1
VIII	74	7.4

Manual training for boys raises a problem difficult of solution, but not insuperable. The essential motivation may be found in the construction of school equipment or of pieces of furniture or other articles desired by the boy. In the latter event, it is probably necessary to require him to pay for the materials used. The course should provide for a variety of activities, such as cabinet making, metal work, printing, etc., in order to furnish an opportunity for revealing the special aptitudes of the pupils. This is vocational guidance of the very best

[1] Fourteenth Year Book.

character, although such work is in no sense vocational training but rather of the nature of directed play. The work should be kept normal by imposing on the pupil a certain amount of responsibility for the quality of the product and the element of time cost. Considerable industrial and scientific information may be imparted by the selection of projects involving the construction of water wheels, derricks, steam engines, electric motors, etc. Such work proves of absorbing interest to boys and may be encouraged by opening the school shops for voluntary attendance on certain afternoons.

Physical Education

In the majority of schools the tendency to separate the work in hygiene and physical education is of manifest disadvantage to both subjects. When the lessons in physiology are carried over into the department of physical education, the application of the teaching is at once evident to the pupil. The theoretical instruction given by the teacher can be supplemented to advantage by practical talks from medical inspectors and nurses on health topics. These come with the added weight of professional opinion and inspire the pupils with ideals of right living.

The time devoted to physical training is all too inadequate. A week consists of 168 hours; if twelve hours a day are given up to sleep, meals, etc., 84 hours remain, which in a state of nature were employed in physical exercise. The school now monopolizes about 25 hours for mental exertion, but the physical nature of the child remains the same: he still requires for normal develop-

ment an abundance of free play. Formal gymnastics will not take its place, and this fact is obtaining recognition in the schools. Play grounds are being established for the enjoyment of games, folk dancing, and athletics under

TIME ALLOWANCE FOR PHYSIOLOGY AND HYGIENE IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Total Time
I	37	4.3
II	41	4.5
III	40	4.4
IV	37	3.8
V	34	3.5
VI	40	4.2
VII	45	4.5
VIII	57	5.7

TIME ALLOWANCE FOR PHYSICAL TRAINING IN FIFTY CITIES[1]

Grade	Hours per Year	Per Cent of Total Time
I	46	5.4
II	41	4.5
III	40	4.5
IV	40	4.2
V	38	4
VI	40	4.2
VII	38	3.7
VIII	39	4

competent directors. Two hours daily would seem none too much for such training, but this time cannot be given within the limits of a five or six-hour session, so the only apparent remedy is the lengthening of the school day and the devotion of the added time to the develop-

[1] Fourteenth Year Book.

ment of the physical well-being of the children. No excellence of academic training can compensate for the loss of health, and no nation can afford to follow a policy which results in undermining the vitality of its future citizens.

Music

It is a generally accepted principle that one of the duties of the school is to train prospective citizens to an intelligent use of leisure. On this theory music has become an integral part of the curriculum, but it has

Time Allowance for Music in Fifty Cities[1]

Grade	Hours per Year	Per Cent of Total Time
I	45	5.2
II	48	5.3
III	47	5.1
IV	48	4.9
V	45	4.7
VI	45	4.6
VII	45	4.4
VIII	44	4.4

not realized its purpose. The school has attempted to teach the child to read music at sight, has failed, and in the process has killed the really vital element — love of music. Mr. Thomas W. Surrette, of the advisory committee for the Boston public schools, suggests as an alternative that children be taught a large number of simple folk songs and that the emphasis be laid upon developing appreciation and love of music rather than upon an attempt to acquire a technical knowledge of the subject which is of little future value.

[1] Fourteenth Year Book.

One of the significant figures in a discussion of time distribution is the number of hours devoted to a subject in all grades. The following table gives the number of cities allotting time to each subject, the average total, the lowest total in any city, the highest, the average deviation, and the average percentage of time.

TOTALS FOR FIFTY CITIES [1]

	Opening	Reading	Language	Spelling	Penmanship	Arithmetic	Geography	History	Science
No. of cities allotting time	45	50	50	50	49	50	50	50	47
Average total time	269	1311	849	454	362	981	474	360	279
Lowest total time	116	675	119	216	244	456	202	140	54
Highest total time	487	2900	1267	774	533	1380	750	700	593
Average deviation (hours)	71	309	163	115	62	175	103	75	106
Percentage of average total recitation time [2]	—	26.3	13.8	7.4	5.9	15.9	7.7	5.8	4.5

	Drawing	Music	Man. Tr.	Phy. Tr.	Recess	Misc.
No. of cities allotting time	48	49	46	46	40	28
Average total time	410	366	316	343	565	397
Lowest total time	242	135	76	40	240	39
Highest total time	760	600	965	918	933	2018
Average deviation (hours)	72	58	132	120	133	237
Percentage of average total recitation time [2]	6.7	5.9	5.1	—	—	—

The policy of the fifty cities given in the Fourteenth Year Book may be verified by reference to the time schedule for the elementary school as published by the State Department of Education in Massachusetts. This

[1] Fourteenth Year Book.

[2] Reckoned on the sum of the averages for the indicated subjects.

MASSACHUSETTS TIME-DISTRIBUTION TABLE

Subject	Minutes per Week						Per Cent per Week					
	I	II	III	IV	V	VI	I	II	III	IV	V	VI
Opening Exercise	60	60	60	60	60	60	5.2	4.9	4.6	4.2	3.9	3.9
English												
1. Reading	240	240	175	175	100	100	20.7	19.7	13.5	12.2	6.5	6.5
2. Spelling	....	50	50	50	50	50	....	4	3.7	3.4	3.3	3.3
3. Language	150	150	175	175	150	150	13	12	13.5	12.2	9.6	9.6
Penmanship	75	75	100	100	100	100	6.5	6	7.6	6.9	6.5	6.5
English Literature	60	60	75	75	150	150	5.2	4.7	5.8	6.2	9.6	9.6
Arithmetic	50	75	100	125	150	150	4.3	6	7.6	8.6	9.6	9.6
History and Civics	....	....	50	75	150	150	....	....	3.7	5.2	9.6	9.6
Nature Study	60	60	60	60	60	60	5.2	4.7	4.6	4.2	3.9	3.9
Music	75	75	75	75	75	75	6.5	6	5.8	5.2	4.8	4.8
Geography	25	25	25	100	150	150	2.2	2	1.8	6.9	9.6	9.6
Handwork and Drawing	150	150	150	150	150	150	13	12	11.6	10.3	9.6	9.6
Physiology and Hygiene	60	60	60	60	60	60	5.2	6	4.6	4.2	3.9	3.9
Recess Play and Games	150	150	150	150	150	150	13	12	11.6	10.3	9.6	9.6
Totals	1155	1230	1305	1430	1555	1555	100	100	100	100	100	100

New Jersey Time Distribution — State Department

Subject	Minutes per Week								Per Cent per Week							
	I	II	III	IV	V	VI	VII	VIII	I	II	III	IV	V	VI	VII	VIII
Reading — Literature	275	175	200	125	100	100	60	60	19.3	12.3	14	8.8	7	7	4	4
Comp. and Grammar	...	75	75	160	160	160	150	150	0	5.2	5.2	11.2	11.2	11.2	10	10
Spell. and Word Study	75	75	50	75	60	60	60	60	5.2	5.2	3.5	5.2	4.2	4.2	4	4
Mathematics	...	75	75	100	125	125	120	120	0	5.2	5.2	7	8.8	8.8	8	8
Geog. and Hist.	...	...	75	100	115	115	120	120	0	0	5.2	7	8.1	8.1	8	8
Penmanship	75	75	75	100	100	100	30	30	5.2	5.2	5.2	7	7	7	2	2
Drawing and Construction	125	125	125	90	90	90	90	90	8.8	8.8	8.8	6.3	6.3	6.3	6	6
Music	50	50	50	60	60	60	60	60	3.5	3.5	3.5	4.2	4.2	4.2	4	4
Chorus	25	25	25	30	30	30	30	30	.7	1.7	1.7	2.1	2.1	2.1	2	2
Industrial Arts	...	...	...	90	90	90	90	90	0	...	...	6.3	6.3	6.3	6	6
Hygiene	...	...	20	40	40	40	30	30	0	...	1.4	2.8	2.8	2.8	2	2
Physical Training	75	50	50	75	75	75	75	75	5.2	3.5	3.5	5.2	5.2	5.2	5	5
Recess and Play	150	125	125	100	85	85	75	75	10.5	8.8	8.8	7	5.9	5.9	5	5
General Exercises	125	75	55	75	50	50	50	50	8.8	5.2	3.8	5.2	5.2	5.2	3.3	3.3
Unassigned and Study	450	500	425	205	245	245	460	460	31.6	35.5	29.8	14	14	14	30.6	30.6
Total	1425	1425	1425	1425	1425	1425	1500	1500	100	100	100	100	100	100	100	100

was prepared by a committee working under the direction of Francis G. Wadsworth, Agent, and was reviewed by a number of prominent superintendents and normal school principals in the state. It represents the consensus of opinion as to the proper time value to assign to each subject.

In addition to the time indicated on the schedule, the New Jersey State program suggests a specified amount of home study.

HOME STUDY PER WEEK

Grades VII and VIII	
Reading and Spelling	2½ hours
Geography	1 hour
History and Civics	1½ hours
Total	5 "
Grade VI	
Geography	1½ hours
History and Civics	1 "
Spelling	1½ "
Total	4 "
Grades IV and V	
Spelling	1½ hours

This imposes no unreasonable burden upon children and tends to develop habits of systematic self-directed study. It has the advantage of promoting home interest in a child's school work and keeps his parents informed of his progress.

CHAPTER IX

THE SCHOOL AS A SOCIAL AND COMMUNITY CENTER

No school system realizes to the full its capacity for community service so long as its activities are restricted to the education of children for five or six hours a day, and the amount of money invested in the plant makes such a limited use uneconomical in every sense of the term.

The most natural step in the direction of a wider usefulness is to open the buildings for evening classes and social center purposes. Extensive as the development of evening school activities has been during the present decade, the possibilities are scarcely beginning to be realized. Increasing numbers of young men and women who, because of the necessity of earning their own living or of contributing to the support of their families, have been deprived of the opportunities offered during the day, are eager to give their evenings to gaining additional power in purely academic subjects as a prerequisite for admission to a desired industry; but even greater than their industrial value is the socializing power of the classes. Their complete change of atmosphere brings refreshment to the tired laundress or the lonely household drudge; to every mechanic the classroom becomes a social meeting place where he may mingle with his fellows; and young men or girls working away from home in business houses find congenial friends among their classmates.

Evening elementary schools serve three distinct purposes:

1. Teaching pupils whose attendance is required by law. (Some states allow children between fourteen and sixteen years of age to secure employment during the day provided they attend classes a prescribed number of evenings.)

2. Training in common branches for English-speaking adolescents and adults.

3. Teaching English to foreigners and employing the lessons as a medium for presenting American ideas with specific instruction concerning the privileges and obligations of citizenship in a republic. It is the evening elementary school which must, to a large degree, solve the problem of assimilating the constant stream of foreigners who come to us in total ignorance of our customs and ideals.

Many cities are already keenly alive to the importance of utilizing their educational machinery for the benefit of young men and women who desire to supplement their fragmentary training. Boston, Massachusetts, has even gone to the length of creating a department solely for the purpose of administering such activities, and the significance of the work is indicated by the following table:

BOSTON EVENING SCHOOLS

	High Schools	Elementary Schools
Number of centers	9	21
Average number of teachers	160	379
Total enrollment	5,989	12,182
Average number of pupils per teacher	26	17
Nights open	65	88
Total attendance	218,113	518,287
Per capita cost per night in teachers' salaries	.186	.134

In strong contrast to this far-sighted policy is the false economy which influences some communities to weigh against the benefit to their future citizenship the immediate money cost of conducting evening classes. To such narrow-minded doubters there is only one answer: that in comparison with the direct and indirect gain to those in attendance and to the community of which they form a part, it would be difficult to suggest any better investment of school funds than in placing educational opportunities before those who voluntarily seek to profit by them.

COMPARATIVE COST OF EVENING ELEMENTARY SCHOOLS

City	Average Attendance	Teachers per Capita Including Supervision	Pupil Cost per Hour Total Expense
Boston, Mass.....	6494	$11.38	.084
Springfield, Mass..	806	8.96	...
Newark, N.J.....	3756	13.93	.115
St. Louis, Mo.....	3552	10.85	.099
Rochester, N.Y...	3207	10.85	...
Montclair, N.J....	253	11.40	.076

COMPARATIVE COST OF EVENING HIGH SCHOOLS

City	Average Attendance	Teachers per Capita Including Supervision	Pupil Cost per Hour Total Expense
Boston, Mass.....	3323	$12.43	.12
Springfield, Mass..	804	12.63	...
Newark, N.J.....	2436	23.44	.16
St. Louis, Mo.....	4743	15.27	.119
Rochester, N.Y...	2044	7.29	...
Montclair, N.J....	212	14.09	.094

Dr. C. A. Perry, in *Wider Use of the School Plant*, gives the pupil cost per evening for high and elementary schools together as .152 in Chicago and .141 in Providence, R.I.

A discouraging feature of evening school work is the irregular attendance of the students and the heavy mortality usually occurring, but when it is remembered that those who enroll come wearied from the work of the day and with little energy left for study, such a condition is not surprising. To attend week after week in the face of such a handicap requires somewhat remarkable perseverance. Then, too, the school must compete with the lure of popular amusements, such as the moving picture theater, which offers in place of continued effort welcome relaxation to the exhausted mind and body.

EVENING SCHOOL ENROLLMENT AND ATTENDANCE [1]

City	Enrollment	Attendance	Sessions	Per Cent Attendance per Evening
Hartford, Conn.....	2522	646	75	26
New Haven, Conn.....	1066	315	75	29
New Britain, Conn....	944	303	75	32
Waterbury, Conn.....	803	518	86	64
Meriden, Conn.....	366	188	75	51
Danbury, Conn.....	282	83	75	29
Ansonia, Conn.....	149	39	50	26
Montclair, N.J.....	707	465	75	76
La Crosse, Wis.....	963	385	75	39

The term "wider use of schools" is not susceptible of exact definition, since customs vary greatly in different cities, but the extent to which Cleveland, Ohio, employs its facilities for the uplift of the city is typical of the general trend of public sentiment.

[1] *Help Your School Survey.* Bureau of Municipal Research, N.Y.

CLEVELAND USE OF SCHOOL BUILDINGS ONE YEAR

	Number of Organizations	Times Used	Total Attendance
Auditoriums.....	292	719	173,247
Gymnasiums.....	197	1975	96,633

Groups Using Schools

Twelfth Ward Improvement Association
East End Chamber of Commerce
East End Neighborhood Club
Women's Suffrage Political League
Municipal School League
Spanish War Veterans
Ladies' Relief Corps
Knights of Pythias Lodge
Public School Association
D. A. R. Clubs
G. A. R. Post
Garment Workers Union
Warner Civic Association
Normal Alumni
Alumni Club
Sanitation Club
Social Center Club
Teachers' and Mothers' Club
Civic League
Western Reserve Dental Club
Thespian Dramatic Club
South End Choral Society
Mendelssohn Choir
Boys' Glee Club
Boy Scouts
Boy Cadets
Camp Fire Girls
Y. W. C. A.
Mothers' Club
Anti-Fly Campaign
Boys' Chef Club
Patrons' Club
Social Club
German Club
Latin Club
Syrian Club

This is reported to be but a partial list of the groups using the school buildings of Cleveland, but it is thoroughly representative and shows concretely the wide range of activities receiving this measure of coöperation from the educational department. The groups paid custodian's fees varying from 30 cents to $5.00 an evening, according to the size of the quarters used. Such a small fee cannot be considered a rental, since it is undoubtedly less than the actual cost of opening the building. As a general proposition the policy of making a charge to

cover the actual cost of janitor service, heat, and light, is sound in principle since, if this is not done, the expenditure must be met from funds provided for other purposes. In addition, it would seem a wise educational measure to make such social activities self-supporting in order to develop a feeling of self-reliance and self-respect. It is quite as possible to pauperize a group as an individual, and when the clubs using the buildings are required to pay a small fee for their enjoyment, a sense of responsibility is developed impossible to secure through a mere gift of the privilege. A policy similar to that of Cleveland is followed in Boston. Under a general director and four assistants are the seven districts of the city, each in charge of a local man, selected because of his knowledge of the situation. The department stands consistently for entertainments of educational significance and value. Programs consisting of good music, illustrated lectures, dramatics, and masterpieces in moving pictures are offered. Emphasis is placed upon building up an adult membership in all centers. In 1916, 3400 persons over sixteen years of age were enrolled. The state law of Massachusetts does not permit the city Board of Education to charge an admission fee for the use of halls or buildings, so expense must be met by voluntary contributions, and tickets are issued to identify subscribers. The state legislation was designed to prevent any Board from making a profit from the rental of school buildings, but Boston finds it a serious handicap in placing clubs upon a self-supporting basis, although fifteen have attained that status in spite of the difficulty.

The total attendance in the seven centers for the year 1916 was as follows:

	Total Attendance
Clubs and entertainments	98,530
English lectures	44,134
Non-English lectures	16,209
122 Home and School Associations	36,388
21 Alumni meetings	3,962
26 Citizen's meetings	4,744
56 Other meetings	6,560
Total	210,527

The work in Montclair, N.J., is in harmony with the tendency toward a wider use of the schools, and represents typical activities for the smaller community. Their varied character is shown by the following list:

Evening Schools
Summer Schools
Playgrounds
Lectures
Concerts
Social Worker in Foreign Section

In addition to these enterprises the educational authorities coöperate to the fullest degree with all reputable organizations desiring the use of rooms in any building. The school department recognizes the right of citizens to use the facilities which they themselves have provided and only a nominal charge is made to cover the cost of janitor service, heat, and light. The following principles govern the action of the department:

1. For meetings in which the school is immediately interested and is the directive agency, no charge.

2. For meetings held for educational purposes by outside organizations with no admission fee, no charge save for janitor service.

3. For meetings held for charitable purposes with

admission fee, a minimum charge, varying according to the size of the hall and cost of opening.

4. For meetings held by outside organizations with admission fee for money-making purposes, a maximum charge, depending upon the size of hall and cost of opening.

A very liberal policy is followed in the application of these principles. A small hall in the administrative building, seating about 75, was used 28 times in a single month by different groups, and no charge was made for the daytime meetings, since they involved no extra expense. The evening charge was $1.50, to pay for the services of the janitor. The following are typical groups using the hall:

Men's Glee Club
Dramatic Society
Alliance Française
Home Makers' Association
Mothers' Club
Women's Club
Department of Education of Women's Club

In the evening school the department agrees to provide a classroom and an instructor for any subject requested by a group of fifteen students. This policy results in classes in stenography, typewriting, bookkeeping, Spanish, French, Latin, Algebra, woodworking, basketry, sewing, cooking, and the common branches.

The evening school report for 1915–1916 gives the following statistics:

Number Sessions	Total Enrollment	Average Enrollment	Average Attendance	Per Cent Attendance
78	707	558	465	76

Total cost	$6243.00
Per capita on enrollment	8.83
Per capita on attendance	13.4[2]

The summer school and playgrounds are carried on as a single enterprise, and the scope of the work is shown by the following statistics:

ACADEMIC WORK

Number Sessions	Total Enrollment	Average Enrollment	Average Attendance	Per Cent Attendance
30	385	286	260	91

Total cost	$1047.00
Per capita on enrollment	2.72
Per capita on attendance	4.03

Five centers were opened in 1915 for play activities, and the work was carried on during July and August. The average attendance for the two months for the five centers was 1350, and the total cost, $2080, or a cost per child of $1.54 for the season.

The lectures and concerts are provided by the joint efforts of the Board of Education, Federated Women's Clubs, and two or three local organizations. The plan is to furnish the community with free lectures and entertainments of a high order of merit. Five centers are opened during the winter, and the scope of the work is indicated by the following table:

Center	Number Concerts	Number Lectures and Entertainments	Total Attendance
High School	12	..	12,000
Hillside	..	13	5,850
Chestnut St.	12	14	6,000
Grove St.	5	5	3,000
Baldwin St.	6	29	12,250
Total	..	..	39,100

The total expenditure made by the Board of Education was but $375. Approximately an equal amount came from all the other agencies together. In many instances those who made up the program gave their services. This is particularly true of the concerts, at which artists made, through their talent, their contribution to the socialized activities of the town.

The idea of a social worker in the foreign section of the town originated with the Central Council of Women's Clubs, and the expense was met by voluntary contributions for the first year. By that time the value of the work had been so fully demonstrated that it was taken over by the School Department and incorporated into the regular activities of the school. The importance of this department and the character of the work appear in the tabular report of the year.

Neighborhood calls	1034
Business calls	160
Organization meetings	26
Addresses before Local Organizations	46
Classes in Mothercraft	28
Classes in Home Economics	28
Classes in Dramatics	40
Moving Picture Entertainments	12
Dramatic Performances	8
Musicales	24
Lectures in Italian	4
Cases of Cruelty Investigated	26
Underfed children cared for	160
Children sent to Fresh Air Home	12

In addition to these activities, the social worker performed an invaluable service in bringing the home and the school into closer relations. By her efforts, also, in enlisting the coöperation of residents from other sections

of the town, those who needed help and those who could give it were brought into friendly contact, the evils of class prejudice were minimized, and personal relations were established through mutual interests.

Any discussion of the social activities of the schools necessarily deals with the question in a somewhat indefinite fashion. It is impossible to set up standards of attainment and costs for the guidance of unlike communities purposing to carry on similar work. One can only indicate its scope by presenting the experience of the three types of school systems used as illustrations in this chapter, with the hope that it may prove suggestive to those who are interested in solving one of the serious problems of the present decade, how to transform the potential usefulness of the idle school plant into actual ministration to those who are barred from its normal activities.

CHAPTER X

SCHOOL BUILDINGS

DR. LEONARD AYRES gives as the five watchwords in the building program for any city: Education, Economy, Safety, Health, and Happiness. The past decade has witnessed such improvement in the type of school buildings that those of the more progressive cities make it difficult to conceive any further architectural progress possible. Minor internal modifications may still be made, but the general ideal has become so widely accepted that any well-informed superintendent has little difficulty in securing the approval of his community for a modern type of school in agreement with the formula of Dr. Ayres.

This chapter will present in tabular form the standards evolved by experts in schoolhouse construction. The superintendent who attempts to build according to precedent will merely perpetuate past errors: his only safe plan is to conform to the accepted practice as established by those who have brought highly trained abilities to the task of designing the best possible model for its purpose.

For one who wishes to determine in how far the already existing buildings of his school plant meet the modern standard, there is no better guide than the Score Card for School Buildings and Equipment, formulated by Dr. George D. Strayer, of Teachers College, New York City. The weighted credits assigned to each item provide an

opportunity of showing in what particulars any building is defective and an approximate estimate of the extent of such deficiency. Since these credits represent the median judgment derived from the scores allowed by a large group competent to judge the worth of the several elements, it follows that they are more reliable than the single judgment of any individual.

SCORE CARD FOR CITY SCHOOL BUILDINGS

By George Drayton Strayer
Teachers College, New York City

Instructions. — 1. Abbreviation: *S* — standard.

2. Basis for scoring — 1000 points.

3. In scoring classrooms, stairways, entrances, fire escapes, and the like, score each separately and insert the average for the final score.

4. It will be worth while to use this card in checking up blueprints of prospective buildings. To do this will require a complete set of specifications with the blueprints, also a copy of state laws and city ordinances.

SHORT FORM OF SCORE CARD

I. Site ..... (125)
- A. Location ..... (55)
  1. Accessibility (25) 2. Environment (30)
- B. Drainage ..... (30)
  1. Elevation (20) 2. Nature of soil (10)
- C. Size and Form ..... (40)

II. Building ..... (165)
- A. Location ..... (25)
  1. Orientation (15) 2. Position on site (10)
- B. External Structure ..... (60)
  1. Type (5) 2. Material (10) 3. Height (5) 4. Roof (5) 5. Entrances (10) 6. Aesthetic Balance (10) 7. Condition (15)
- C. Internal Structure ..... (80)
  1. Stairways (35) 2. Corridors (25) 3. Basement (15) 4. Attic (5)

III. SERVICE SYSTEMS ..... (280)
- A. Heating and Ventilation System ..... (70)
  1. Kind (20) 2. Installation (10) 3. Air Supply (25) 4. Distribution (15)
- B. Fire Protection System ..... (65)
  1. Apparatus (10) 2. Fireproofness (20) 3. Escapes (20) 4. Electric Wiring (5) 5. Fire Doors (10)
- C. Cleaning System ..... (20)
- D. Artificial Lighting System ..... (20)
- E. Electric Service Systems ..... (15)
  1. Clock (5) 2. Bell (5) 3. Telephone (5)
- F. Water Supply System ..... (30)
- G. Toilet System ..... (50)
  1. Distribution (10) 2. Fixtures (10) 3. Adequacy (10) 4. Seclusion (5) 5. Sanitation (15)
- H. Mechanical Service Systems ..... (10)
  1. Elevators (5) 2. Book-lifts (2) 3. Waste-chutes (3)

IV. CLASSROOMS ..... (290)
- A. Location and Connections ..... (35)
- B. Construction and Finish ..... (90)
  1. Size (25) 2. Shape (15) 3. Floors (10) 4. Walls (10) 5. Doors (5) 6. Closets (5) 7. Blackboards (10) 8. Color-scheme (10)
- C. Illumination ..... (85)
  1. Glass area (45) 2. Windows (30) 3. Shades (10)
- D. Cloakrooms and Wardrobes ..... (25)
- E. Equipment ..... (55)
  1. Seats and Desks (40) 2. Teacher's Desk (10) 3. Bulletin Boards (5)

V. SPECIAL ROOMS ..... (140)
- A. Large Rooms for General Use ..... (65)
  1. Playroom (10) 2. Auditorium (15) 3. Study Hall (5) 4. Library (10) 5. Gymnasium (15) 6. Lunch Room (10)
- B. Rooms for School Officials ..... (35)
  1. Offices (10) 2. Teachers' Room (10) 3. Nurses' Room (10) 4. Janitor's Room (5)
- C. Other Special-Service Rooms ..... (40)
  1. Laboratories (20) 2. Lecture Rooms (10) 3. Store Rooms (5) 4. Studios (5)

DETAILED SCORE CARD FOR CITY SCHOOL BUILDINGS

I. SITE

A. Location

1. Accessibility — centrality (present and future), car lines, streets.
2. Environment:
   a. Physical — gardens, trees, shrubbery, buildings, hills. (*S* — Skyline should not have an angle of more than 30 degrees from base of building.)
   b. Social — density of settlement, composition, moral influences.
   c. Protection — freedom from noise, dust, danger, malodors.

B. Drainage

1. Elevation, slope. (*S* — Grounds should slope away from building and should not exceed 1 in. for every 3 ft.)
2. Nature of soil — residual or artificial, kind, texture, aeration, hydration, surface material.

C. Size and Form

Should be large enough and of good shape to allow for proper placing of building, for 30 sq. ft. of playground per child, and for school garden.

II. BUILDING

A. Location

1. Orientation — light, exposure. (*S* — S.East, East, S.West, West, and South in order.)
2. Position on site as regards appearance and economy of playgrounds.

B. External Structure

1. Type — rectangle, square, inner court, T, H, E, U.
2. Material. (*S* — brick or stone.)
3. Height — number of stories. (*S* — Two stories above basement.)
4. Roof — type and material. (*S* — Flat, waterproof, suitable for playground, proper slope for drainage.)
5. Entrances:
   a. Number, location, width. (*S* — At least two near stair landings, 11–13 ft. wide.)
   b. Steps — number, protection from the elements. (*S* — As few as possible, unexposed.)
   c. Vestibules — size, lighting. (*S* — 11–13 ft. wide, double swing glass doors, and waterproof floors.)

d. Doors — kind, opening, springs, checks, stops. (*S* — 3½ ft. x 8 ft., opening outward with panic bolts.)

6. Aesthetic balance. (*S* — Simplicity and utility.)
7. Condition. (*S* — Should be in good repair.)

C. Internal Structure

1. Stairways.
   a. Construction — kind (box, open, winding), material, tread and riser, nosing, width, landing, banister (number, kind, size, stability), soundproofness. (*S* — Tread, 11–13 in.; riser, 7 in.; width, 5 ft.; metal banister, 1½ in. dia., at least 2 for each stairway firmly attached.)
   b. Number and location — proximity to exits. (*S* — At least two, landings near exits.)
   c. Lighting — natural and artificial. (*S* — Should be well lighted.)
   d. Sanitation — coves, corners, ledges. (*S* — should have sanitary coves and be free from dust catchers.)
2. Corridors.
   a. Location.
   b. Construction — material, width, door arrangement, finish (chair rail, picture mold, dado). (*S* — Width 11–13 ft.)
   c. Obstructions — lockers, cases, pedestals. (*S* — These should not obstruct easy passage.)
3. Basement.
   a. Depth below grade, dampness, areas. (*S* — Depth, 3 ft.; floor and walls waterproof.)
   b. Boiler-room, accessibility to fuel room, exits, ash-lifts.
   c. Fuel room, size, construction, chute.
4. Attic, waterproof, heatproof, floor.

III. SERVICE SYSTEMS

NOTE. — Defects in any service-system should be checked against the system, wherever found.

A. Heating and Ventilating System

1. Kind of system — direct, direct-indirect, gravity, plenum, plenum-exhaust.
2. Installation — piping, workmanship, noise, control. (*S* — All piping should be insulated.)
3. Air Supply — source, amount, humidification, duct. (*S* — From the top of the building; humidity 40–60%; 2000 cu. ft. per hour per pupil, should not enter with a velocity greater than 6 ft. per second.)

4. Distribution — size, arrangement, kind of ducts, pipes and radiators. (*S* — Single ducts for each room; inlets 8–9 ft. above floor, outlets near floor.)

B. Fire Protective System

1. Apparatus — fire hose, extinguishers, water pressure, fire alarms. (*S* — Adequate supply on each floor; fire alarms easily accessible, automatic in boiler room, connected with city fire department.)
2. Fireproofness:
   a. Building as a whole — rating of underwriters.
   b. Stairways. (*S* — Encased fireproof stair-wells.)
   c. Boiler and fuel rooms. (*S* — Separate fireproof rooms.)
3. Fire escapes — number, location, kind, protection, number of exits. (*S* — In non-fireproof buildings there should be at at least two fire escapes.)
4. Electrical work — nature and place of intake, insulation, number and kind of outlets, location of switches, meter, cut-out, cabinets. (*S* — Should be installed according to rules of underwriters.)
5. Fire doors — kind, location, operation. (*S* — Automatically closing.)

C. Cleaning System

Kind, installation, efficiency. (*S* — Vacuum system.)

D. Artificial Lighting System

Kind, amount, distribution, number and location of switches, outlets for lanterns, etc.

E. Electric Service Systems

1. Clocks.
2. Bells and gongs.
3. Telephones — number and location. (*S* — At least one on each floor.)

F. Water Supply System

Drinking fountains, baths, lavatories, janitor's supply (on each floor). Installation and sanitation.

G. Toilet System

1. Distribution — location, accessibility. (*S* — Most on first floor, others distributed.)
2. Fixtures — (seats, urinals, washbowls, sinks, towel and paper holders), size, kind, durability, and arrangement.
3. Adequacy — number. (*S* — 1 seat for each 15 girls, 1 seat for each 25 boys, 1 urinal stall per 10 boys.)
3. Seclusion — soundproofness, doors.

5. Sanitation — finish, material, workmanship, lighting, ventilating. (*S* — Material — not absorbent, non-corrosive.)

H. Mechanical Service System

1. Elevators (for buildings of more than four stories) — location, fireproofness, adequacy.
2. Book-lifts.
3. Waste chutes — kind, location, size. (*S* — Fireproof, outlets closing, automatically.)

IV. CLASSROOMS

A. Location and Connections (to exit, drinking fountains, toilet). Deduct for basement rooms and those above fourth floor without elevators.

B. Construction and Finish

1. Size. (*S* — Per pupil 15 sq. ft. floor space and 200 cu. ft. air space.)
2. Shape — classroom 24 x 30 x 12 ft.
3. Floors — material, condition (cracks, checks, splinters, loose boards, projecting ends), width of boards, soundproofness, cove, baseboard, surface, finish. Stone, tile, cement, and other composition floors are bad for class or study rooms. (*S* — Should be battleship-linoleum, or hard wood, durable, well joined, and not dust-retaining.)
4. Walls, Ceiling — plastering, finish, texture, condition, picture mold, chair rail, kind and condition of dado. (*S* — Hard, smooth, non-glass plaster, with cement plaster for dado, avoiding grooves and ledges.)
5. Doors — how opened, size, kind, lock, threshold, transom, number of exits. (*S* — Doors without thresholds and transoms.)
6. Closets and Bookcases — location, size, convenience.
7. Blackboards — kind, length, width, color, chalk rail, height from floor, surface, quality, condition, trim. (*S* — Slate, full black, on front and side of room, 36–42 in. wide, height of chalk rail, grades 1–2, 24 in.; 3–4, 26 in.; 5–6, 28 in.; 7–8, 30 in.; high school, 32–36 in.)
8. Color scheme — woodwork, dado, walls, ceiling, furniture, shades, finish, fixtures. (*S* — Neutral color, buff or green; dado slightly darker than walls, white or cream ceiling; woodwork, furniture and shades to harmonize in tone; dull, smooth finish.)

C. Illumination

1. Glass Area — $\frac{1}{4}$ to $\frac{1}{5}$ area of floor.

2. Windows — size of mullions, nearness to ceiling, height of sill, kind of glass, distance of front window from front wall, orientation, shape. (*S* — From pupils' left, unilateral, grouped, symmetrical, as near ceiling as possible, 3½ to 4 ft. from floor, plain glass, mullions not over 12 in. wide. Front windows should not come within 5 ft. of front wall; easterly exposure best; rectangular in shape.)
3. Shades — kind, material, hanging, adjustment, condition. (*S* — Adjustable from center.)

D. Cloakroom, Wardrobe

Location, size, convenience, ventilation, finish. (*S* — Ample ventilation and accommodation.)

E. Equipment

1. Seats and desks — kind, number. (*S* — Adjustable-movable or adjustable; not over 42 in number.)
2. Teacher's desk. (*S* — No platform.)
3. Bulletin boards.

V. Special Rooms

A. Large Room for General Use

1. Playroom — location, size, accessibility, adaptability, finish. (*S* — Per pupil 15 sq. ft. floor space and 200 cu. ft. of air space.)
2. Auditorium.
   a. Location, accessibility. (*S* — Should be on first floor.)
   b. Construction — size, height, seating capacity, floor, acoustics, exits, obstructions, gallery (kind, seating capacity, location), light and nature of stage, finish, ornamentation. (*S* — for 80 ft. length on flat floor, stage should be 3 ft. 8 in. high; on dish floor, 3 ft.)
   c. Auxiliaries — dressing-rooms, curtain, setting, seats (kind, arrangement).
3. Study Hall — location, size, accessibility (especially to library), adaptability, finish.
4. Library — location, size, accessibility, form and arrangement of stacks.
5. Gymnasium:
   a. Location — accessibility, segregation of sexes.
   b. Construction — size, floor, track, gallery, soundproofness, finish. (*S* — Height 22–25 ft. Length and width should relate as 3 to 2.)
   c. Auxiliaries — lockers, showers, dressing-room (number, kind, location, convenience, condition).

6. Lunch room — location, accessibility, size, adaptability, arrangement, finish, sanitation.

B. Rooms for School Officials

1. Offices — location, size, adaptability, finish; waiting room (ditto).
2. Teachers' Room — location, size, toilet facilities, equipment, finish. (*S* — Equipped with chairs, couch, gas or electric plate.)
3. Nurses' Room — location, size, equipment and toilet facilities (including bath), adaptability, sanitation, finish.
4. Janitor's Room — location, size, convenience.

C. Other Special-Service Rooms

NOTE. — Include all facilities for chemistry, physics, biology, physiography, commercial work, household and industrial arts.

1. Laboratories.
   a. Kind, location, size, adaptability. (*S* — Depends on number of pupils to be accommodated. A room 30 x 40 ft. will accommodate 25 pupils.)
   b. Construction — plumbing, storerooms, cabinets, finish.
2. Lecture Room — location, size, seating capacity, plumbing facilities, accessibility, fixed furniture (number, kind, arrangement).
3. Supply and Store Rooms — location, size, adaptability.
4. Studios — kind, location, size, adaptability.

NOTE. — Include drawing, art, and music rooms.

The total of credits attainable for a building which meets the standard determined by the median judgments of qualified experts is 1000. By comparison it becomes possible to state definitely the condition of any given building. To say in the general terms of the casual observer that it is good or fair, or that it ought to be condemned and torn down, makes no definite impression; but to declare, with figures to support the affirmation, that it is only half-way up to the standard carries unavoidable conviction.

Dr. Strayer's scale was employed in rating ten buildings in Montclair, N.J. The conditions made possible the

widest variation in its application, since the five scorers, to whom it was absolutely new, were given no instructions as to its use; yet the reasonable uniformity in the results testifies to its worth.

RESULTS OF APPLYING BUILDING SCALE

Buildings	I	II	III	IV	V	VI	VII	VIII	IX	X
Scorer 1...	924	816	575	798	705	823	876	590	665	840
" 2...	945	908	634	823	789	845	930	685	734	853
" 3...	966	951	681	815	705	883	960	615	617	906
" 4...	898	860	590	796	804	796	802	695	650	875
" 5...	960	930	515	860	750	860	895	670	690	850

More uniformity would have been obtained if those to whom the task was entrusted, after scoring a trial building, had met to discuss results and thus corrected any personal tendency to lay undue emphasis on special features.

Such a plan was followed in a recent survey at St. Paul, Minn., where twelve persons scored each building in the city. The result of the preliminary training appears in the uniformity of the values assigned by three judges to some of the essential factors in a single building.

The significance of the figures lies not in the variation of the values attributed to any single feature, but in the fact that the total as found by each of the scorers differs from the median by a minimum of one per cent and a maximum of three per cent. Such variations are wholly negligible in reaching a decision relative to the character of the building, and their small degree proves that the use of the scale is practically independent of the personal equation.

Of all problems connected with school administration

COMPARATIVE JUDGMENT OF THREE SCORERS

Score No.	6	9	12
Item I....	85	71	83
A.....	45	30	45
B.....	20	26	23
C.....	20	15	15
Item II....	94	113	91
A.....	15	22	16
B.....	44	36	26
C.....	35	55	49
Item III...	116	123	115
A.....	31	32	30
B.....	0	8	9
C.....	13	15	16
D.....	0	0	0
E.....	5	15	15
F.....	15	2	5
G.....	42	41	35
H.....	10	10	5
Item IV...	174	186	187
A.....	35	25	25
B.....	49	67	60
C.....	47	50	56
D.....	20	20	16
E.....	23	24	30
Item V....	111	78	75
A.....	45	28	35
B.....	28	13	10
C.....	38	37	30
Total..	580	571	551

that of building costs is the most difficult to standardize, and yet its standardization is a matter in which the superintendent is vitally interested. In different cities buildings of approximately the same pupil capacity show radical variations due to the difference in cost of material and labor, the quality of the finish, the amount spent for

purely architectural effect, the number of supplementary rooms, and the space wasted. These features make it necessary to use extreme care to insure comparisons made on exactly the same basis. Several different units are employed in estimating costs, and if they all show the same general tendency the chances are that inferences drawn from them are reasonably sound. Cost per cubic foot is the unit often taken by school architects for comparative data, and the common method is to multiply the ground area of the building by the distance from the basement floor to the average height of the roof; but published figures are not wholly reliable because different architects employ different methods in ascertaining cubical contents, and comparisons are not valid save for buildings of similar construction computed by precisely similar methods.

Cost per pupil is another basis frequently employed. Here again the cost of one building over another may be due to the material used, expensive finish, or additional accommodations such as auditorium, gymnasium, play room, etc. Comparative costs on this basis must specify the accommodations provided or they are valueless. The cost per classroom is open to all the objections of the unit based upon pupil cost, and in addition the size of the rooms or the number of pupils accommodated by them may make one building nearly twice as expensive as another in which the space allowance is less generous.

Despite these inconsistencies and variations, the experience of other communities furnishes suggestive information regarding costs of construction. In the Cleveland Survey Dr. Leonard Ayres has published detailed statements of building costs in five cities.

COST DATA FOR NINE FIREPROOF ELEMENTARY SCHOOLS IN BOSTON

School	Date	Class-rooms	Special Rooms	Pupils	Cost of Building	Plans, Spec. and Inspection	Cost per Classroom	Cost per Pupil	Cost per Cu. Ft.
Patrick Collins	1907	17	5	753	$194,330	$17,666	$11,431	$258	$0.265
Edward Everett	1909	14	7	512	118,267	10,752	8,448	231	.229
Nathan Hale	1909	12	4	400	73,955	6,723	6,163	185	.222
John Cheverus	1909	16	7	587	112,977	10,271	7,061	192	.211
Peter Faneuil	1910	17	4	633	118,888	10,808	6,993	188	.275
Wm. Garrison	1910	10	2	383	72,766	6,615	7,277	190	.264
Samuel Adams	1910	22	7	757	138,194	14,381	7,191	209	.260
Lafayette	1911	8	4	293	69,084	6,280	8,636	236	.313
A. Lincoln	1911	40	8	1517	308,097	28,009	7,702	203	.266

COST DATA FOR ELEVEN FIREPROOF ELEMENTARY SCHOOL BUILDINGS IN CLEVELAND [1]

School	Date	Class-rooms	Special Rooms	Pupils	Cost of Building	Plans, Spec. and Inspection	Cost per Classroom	Cost per Pupil	Cost per Cu. Ft.
Eagle	1911	21	20	933	$144,492	$5000	$6881	$155	$0.177
Mt. Pleasant	1912	12	7	533	82,228	2820	6852	154	.150
Dawning	1912	12	8	533	87,293	3000	7274	164	.158
Chesterfield	1913	12	8	533	100,011	3425	8334	188	.180
Kennard	1913	23	14	1022	153,430	5250	6671	150	.161
E. Boulevard	1913	19	9	844	136,430	4660	7181	162	.179
Addison	1913	17	12	756	131,585	4500	7740	174	.191
Empire	1914	21	12	933	179,447	6150	8545	192	.168
Rawlings	1914	21	14	933	194,280	6650	9251	208	.159
Murray Hill	1915	28	24	1244	235,800	8000	8421	190	.185
Almira	1915	25	14	1111	206,540	7050	8262	186	.178

[1] Cleveland Survey, 1916.

Cost Data for Ten Fireproof Elementary School Buildings in Detroit [1]

School	Date	Class-rooms	Special Rooms	Pupils	Cost of Building	Plans Spec. and Inspection	Cost per Classroom	Cost per Pupil	Cost per Cu. Ft.
Breitmeyer	1915	20	7	765	$106,846	$5087	$5342	$140	$0.166
Marxhausen	1915	20	7	813	87,269	4155	4363	107	.142
Ellis	1915	20	5	812	95,207	4533	4760	117	.149
Joyce	1915	20	7	812	97,402	4638	4870	120	.152
Lingemann	1915	20	7	746	101,783	4846	5089	136	.157
Thirkell	1915	20	7	812	92,845	4421	4642	114	.146
Albert Hely	1915	20	7	785	93,282	4442	4664	119	.151
Hattie M. Carstens	1915	20	7	827	104,389	4970	5219	126	.167
Goldberg	1915	20	13	757	110,303	5252	5515	146	.171
Theodore Harms	1916	20	7	815	105,046	5002	5252	129	.156

Cost Data for Nine Fireproof Elementary School Buildings in Newark [1]

School	Date	Class-rooms	Special Rooms	Pupils	Cost of Building	Plans, Spec. and Inspection	Cost per Classroom	Cost per Pupil	Cost per Cu. Ft.
Lafayette	1910–14	43	10	1935	$277,943	$13,235	$6464	$144	$0.231
Ridge	1911	18	7	720	121,333	5,778	6741	168	.177
Webster	1911	16	8	720	129,003	6,143	8063	180	.187
Westside	1911–14	39	6	1665	209,511	9,977	5372	126	.195
Montgomery	1911	25	6	1035	148,022	7,049	5921	143	.192
Teshine	1911	16	5	630	110,610	5,267	6913	175	.187
Cleveland	1912	39	5	1665	253,283	12,061	6494	152	.217
Miller	1913	18	3	810	138,600	6,600	7700	171	.187
Oliver	1915	22	5	903	134,311	6,396	6105	149	.189

[1] Cleveland Survey, 1916.

COST DATA FOR SEVEN FIREPROOF ELEMENTARY SCHOOL BUILDINGS IN ST. LOUIS[1]

School	Date	Class-rooms	Special Rooms	Pupils	Cost of Building	Plans Spec. and Inspection	Cost per Classroom	Cost per Pupil	Cost per Cu. Ft.
Madison	1910	26	10	1127	$200,798	.....	$ 7,723	$178	$0.212
Harney Hts.	1911	20	10	867	197,712	$5691	9,886	228	.185
Bryan Hill	1911	22	8	953	189,768	7993	8,626	199	.172
Delaney	1911	10	3	433	100,468	5014	10,047	232	.237
Wm. Glasgow	1912	27	7	1170	224,631	9039	8,320	192	.180
Laclede	1914	24	6	1040	200,539	8316	8,356	193	.1875
Bryan-Mullanphy	1915	22	9	953	229,182	9175	10,417	240	.175

COST DATA FOR FORTY-SIX FIREPROOF ELEMENTARY SCHOOL BUILDINGS IN FIVE CITIES[1]

City	Number of Buildings	Average Cost per Classroom	Average Cost per Cu. Ft.	Average Cost per Pupil	Special rooms for 20 Classrooms	Average Cost per Room, Spec. and Class	Per Cent for Plans, Spec. and Insp.
Detroit	10	$4972	$.156	$125	7.4	$3629	4.76
Newark	9	6641	.196	156	4.7	5232	4.76
Cleveland	11	7765	.171	175	13.5	4678	3.42
St. Louis	7	9054	.193	209	7	6584	3.96
Boston	9	7878	.256	210	6.2	6012	9.10

[1] Cleveland Survey, 1916.

In the report of the Survey of the Schools of Buffalo, N.Y., made by the State Educational Department, appears a table of the capacity and pupil cost of 72 high schools throughout the United States. Although some of the data given by Dr. Ayres are lacking, the Buffalo report furnishes a valuable basis for comparison.

HIGH SCHOOL DATA 72 BUILDINGS

City		Capacity	Cost per Pupil
Philadelphia, Pa.	Southern High School	1339	$270
	West High School	3754	311
	William Penn High School	2167	274
Salt Lake City, Utah	West High School	2310	130
	East High School	1500	366
Oklahoma, Okla.	Oklahoma High School	2100	309
Chicago, Ill.	Harrison High School	2000	425
	Hyde Park High School	2000	300
	Senn High School	2000	300
Cambridge, Mass.	High School	2000	125
Paterson, N.J.	High School	2000	175
Minneapolis, Minn.	Central High School	2000	282
	North High School	1705	290
Baltimore, Md.	Polytechnic Institute	1895	329
	Eastern High School	1541	237
	Western High School	1891	153
Spokane, Wash.	High School	1800	264
	Central High School	1500	240
Oakland, Cal.	High School	1800	166
Tacoma, Wash.	Stadium High School	1700	154
Kansas City, Mo.	Westport High School	1300	296
	Northeast High School	1650	330
	Central High School	1500	350
Cincinnati, Ohio	Hughes High School	1600	469
	Woodward High School	1400	523
	Walnut Hills High School	675	178
New Haven, Conn.	High School	1550	187
Fort Worth, Texas	High School	1500	133
	N. Fort High School	500	120

HIGH SCHOOL DATA 72 BUILDINGS (*Continued*)

City		Capacity	Cost per Pupil
Grand Rapids, Mich.	Central High School	1500	300
	Union High School	1200	192
Memphis, Tenn.	High School	1500	230
	High School	737	63
Los Angeles, Cal.	Manual Arts High School	1500	234
	Lincoln High School	800	250
	Polytechnic High School	1500	133
Indianapolis, Ind.	High School	1500	300
Richmond, Va.	Armstrong High School	428	51
	John Marshall High School	1427	268
Portland, Ore.	Washington High School	1200	199
	Lincoln High School	1400	366
	Jefferson High School	1400	218
Duluth, Minn.	High School	1400	392
Newark, N.J.	East Side High School	600	424
	Central High School	1400	401
	South Side High School	1200	304
Johnstown, Pa.	High School	1400	160
Seattle, Wash.	Lincoln High School	1400	264
	Franklin High School	1000	375
	Queen Anne High School	1000	250
Worcester, Mass.	Central High School	1172	315
	Class High School	929	204
	South High School	800	226
Altoona, Pa.	High School	1160	172
Nashville, Tenn.	High School	1127	322
Detroit, Mich.	Northwestern High School	800	404
	Western High School	1104	269
New Orleans, La.	Eskalange High School	900	222
	Warren High School	1100	281
	Wright High School	900	222
Passaic, N.J.	High School	1000	205
New Bedford, Mass.	High School	1000	639
Providence, R.I.	Technical High School	1000	233
	Hope St. High School	600	271
East St. Louis, Mo.	High School	800	112
Hoboken, N.J.	High School	750	332

HIGH SCHOOL DATA 72 BUILDINGS (*Continued*)

City		Capacity	Cost per Pupil
Mobile, Ala.	High School	750	100
Waterbury, Conn.	High School	700	231
Bridgeport, Conn.	High School	550	153
Lancaster, Pa.	High School	500	352
Allentown, Pa.	High School	500	1000
Covington, Ky.	High School	360	139
Average 72 schools		1315	$270

Even a superficial consideration of the building problem for any community serves to reveal its complexity. The disposition of old buildings, once the pride of the city but now made obsolete by changing standards, must be determined. State building codes and municipal ordinances impose definite requirements. The use of the school as a social center involves certain modifications of the structure. If physical training is to be effective, a gymnasium is essential. If the school is large, one must be provided for the boys and a second for the girls. In many instances population growth far exceeds the resultant increase in ratables. Fireproof or slow burning construction must now be used in place of wood to reduce the risk to children's lives. School equipment of a type both hygienic and comfortable is necessary. Even this partial list provides an explanation for the immensely rapid increase in school costs in recent years.

The American public assumes this burden cheerfully because of its belief in the value of education but it behooves every public school administrator to reduce this expense so far as is consistent with the welfare of the children. In accomplishing this purpose two guiding

principles should be followed. First: build for utility. Corridors wider than are necessary, excessive size of rooms, and waste space should be avoided. Such extravagance usually adds little to the attractiveness of the building and materially increases the burden upon the tax payer. The second guiding principle is that the building should be planned to fit the needs of the children. In realizing this purpose no hard and fast rules can be formulated. Designs will vary according to local needs, but so long as the interests of children are the determining influence school authorities may rely upon the hearty coöperation of the public.

CHAPTER XI

SCHOOL HYGIENE

BOSTON was the first American city to recognize the importance of the health conservation of public school children, not alone from humanitarian motives but for the sake of preventing the educational waste due to the presence of physical defects. In 1894 a system of medical inspection was established under the control of the Board of Health. The original object was the detection of cases of contagious disease in order to prevent the infection of other children, but this feature has sunk to minor importance. Today medical inspection also attempts to determine incipient physical defects which interfere with a child's ability to profit from school instruction; or, broadly speaking, it works in two fields, the remedial and the preventive, and of these the latter is the more important. It is mere common sense to demand that before the attempt is made to educate a child he shall so far as possible be prepared physically to receive the education.

The prevalence of physical abnormalities is greater than is popularly supposed to be the case. From a study of all available statistics, involving millions of children, by the Committee on Health Problems of the National Council of Education, a very careful estimate has been made of the percentage of the physically defective who are likely to be found in any community.

PERCENTAGE OF PHYSICAL DEFECTS — COUNTRY AND CITY CHILDREN

	Country	City
Teeth Defects	49%	33.5%
Tonsils	28.1	16.4
Adenoids	23.4	12.5
Eye Defects	21	13.4
Malnutrition	16	7.6
Enlarged Glands	6.4	2.7
Ear Defects	4.7	1.3
Breathing Defects	4.2	2.1
Spinal Curvature	3.5	.8
Anæmia	1.6	1.5
Lung Diseases	1.2	.3
Heart Disease	.7	.4
Mental Defects	.8	.2

With such a percentage of children physically handicapped, it is of great importance that the school provide an adequate medical staff to handle the problem effectively. Experience shows that the work is more successful when both nurses and doctors are employed, but if conditions make it impossible to secure both, the physician should be eliminated rather than the nurse, because the problem is more social than medical, and the home visitation by the nurse is even more important than the original detection of the physical defect. When dependence is placed upon printed notices to parents, only a small fraction will be acted upon, usually not more than 5 to 30 per cent. Insistent visits by a nurse will bring this proportion up to 85 or 90 per cent if she is tactful and convincing in her ministrations. The routine of inspection, the treatment of parasites, small wounds and bruises, and other minor school ailments can be cared for by the nurse no less efficiently than by the physician, and the

employment of nurses has the further advantage of avoiding the professional jealousy often existing among school physicians.

When a complete staff can be secured, what is the number needed to care for the health of school children in an adequate manner? Prof. L. M. Terman, of Leland Stanford University, gives the following as the proper quota:

1 Medical Director, full time.
1 Assistant Medical Director, half time for 6000 elementary school children.
1 Woman Physician, full time for 800–1200 high school girls.
1 Man Physician, full time for 800–1200 high school boys.
1 Nurse, full time for every 2000 elementary school children.
1 Dentist, half time for 10,000 pupils.
1 Eye, Ear, Nose, and Throat Specialist, half time for 10,000 pupils.

In suggesting this quota it is assumed that adjustments will be made for smaller school systems. The small community can secure reasonably adequate service through the help of part time physicians who are willing to give an hour or two a day to the schools, and through the employment of full time nurses to supplement this professional service. Arrangements can usually be made with the local hospital to care for minor operations, such as the removal of adenoids, and with local dentists to attend to the teeth of the children who present themselves with credentials approved by the nurse.

That comparatively few cities find it possible to realize the ideal indicated by Dr. Terman is apparent from the report of a Committee on Health Problems appointed by the National Education Association. This report gives conditions in a group of selected cities.

RATIO OF CHILDREN TO DOCTOR AND NURSE

City	Number of Children for one Physician	Number of Children for one Nurse
Newark, N.J.	1500	7,600
Boston, Mass.	1500	3,200
Spokane, Wash.	2200	
Detroit, Mich.	2400	10,250
St. Louis, Mo.	2700	2,800
Chicago, Ill.	3300	4,600
Milwaukee, Wis.	4200	10,250
Cleveland, Ohio	6250	4,200
Minneapolis, Minn.	6750	6,750
New York, N.Y	8850	4,600

School systems large enough to employ the full staff should be able to secure the needed service at approximately the following schedule.

Director	$3000 to $3500
Assistant Physician	$1800 to $2500
Specialist, half time	$1500
Woman Physician	$2000
Dentist	$2000
Nurses, each	$700 to $1000
Equipment	$500

Estimates vary as to the per capita cost for this department. Dr. Terman estimates the necessary total cost of adequate medical supervision at from 75 cents to $1.00 per school child. Basing his conclusions on the returns from twenty-five cities in New England, New York, and New Jersey, Dr. Louis W. Rapeer finds .011 per cent of the total school budget is devoted to medical inspection. The amount suggested by Dr. Terman is a more satisfactory basis of calculation, since many of the cities included in the Rapeer list are conducting the work in an inadequate manner.

No school system is meeting its full responsibility unless special accommodations are provided for atypical children. Among these are included children with a tubercular tendency or those who are ill-nourished and anæmic. Well-developed cases of tuberculosis have no place in the public school and should be cared for in proper institutions unless strictly tubercular classes are established. Children who are predisposed to the disease may be saved from it if well-recognized preventive measures are followed. These consist of adequate nourishment and sleep, with an abundance of sunlight and fresh air, and for providing such conditions the accepted practice is to establish a so-called open-air school. This school should be strictly distinguished from the open-window classroom, since experience indicates that simply opening windows to secure a low temperature is productive rather of harm than good.

The proper equipment of open-air classrooms and the treatment of the pupils are as completely standardized as for normal classes. The weight of medical and educational authority sanctions the following procedure:

1. Classes should be housed in small buildings in parks, school yards, or on the roof of the regular school.

2. The rooms should be open on three sides, with movable windows or canvas curtains to protect the pupils from severe wind or inclement weather. Additional sunlight may be provided by skylights in the roof.

3. Pupils should be assigned to the classes only after a careful examination by the medical inspector and should be reëxamined weekly.

4. Movable furniture should be provided and also sitting bags and additional clothing. The menu for the

warm food given three times daily should be arranged in conformity with expert advice.

5. The program should allow frequent rest periods and an hour's sleep in the middle of the day. This necessitates in addition to the classroom a well-ventilated room provided with cots and heavy blankets.

6. Visits by the nurse should insure the effective coöperation of the home.

7. The classes should enroll approximately twenty-five pupils, restricting them to two or three grades.

Inevitably the expense of such classes is more than for ordinary pupils, but it is fully justified if the health and lives of the children are taken into consideration.

In Montclair, N.J., the maintenance cost is as follows for one class:

Maintenance — 1916

Teacher	$1000
Matron	634
Helper	118
Janitor	150
Food for year	821
Coal and gas	215
	$2938
Per capita	146.90

Initial Expense

Building	$700
Furniture	150
Clothing, etc.	75
Total	$925

CINCINNATI, OHIO — Twenty-five Pupils

Building	$1266
Equipment	600
Average maintenance	$2.35 per week per child

NEWARK, N.J. — Annual Cost per Pupil

Salaries	$66.04
Supplies	44.26
Repairs	3.36
Miscellaneous	7.26

CHICAGO — Thirty Children One Month Cost

Transportation	$46.30
Cook and helper	30.90
Nurse, half time	35.00
Bread, etc.	15.35
Milk and cream	68.90
Butter and cheese	10.42
Eggs	44.03
Groceries	13.59
Fruit and vegetables	22.91
Meat and fish	14.25
Ice	4.00
Sweets	.85
Tooth brushes	6.00
Miscellaneous	8.96
	$321.46

Cost per Child per Day

Food	$ .29
Transportation	.07
Miscellaneous	.12
Total	$ .48

The extent to which other classes for exceptional children are necessary depends upon the size of the school system. Every community should provide in some way for subnormal pupils. All authorities are agreed that the number of children of this type is from 1.5 to 2 per cent of the total enrollment. The larger school systems should have classes for the deaf, estimated

to be .5 per cent of the enrollment; classes for children with speech defects, estimated to be from 1 to 1.8 per cent of the enrollment; classes for the semi-blind, the crippled, and for truants and incorrigibles.

The expense of caring for children of the types indicated finds full justification in the relief afforded normal classes by their withdrawal. Without being able to profit from the instruction of the ordinary classroom, they monopolize the time and attention of the teacher to such a degree that the normal children lose their rightful share. Efficiency and humanity require that they be taught in separate groups, where the instruction may be adapted to their special needs.

The wise assignment of pupils to the kind of class in which they can best be taught avails little if the building in which the instruction is given is unhealthful.

For the superintendent who wishes to make a general sanitary survey of his own school buildings, the following list of items may prove suggestive.

CHECKING LIST SANITARY SURVEY

Item	Standard
I. SCHOOL BUILDING.	
1. Square feet floor surface each room?	
2. Cubic feet each room?	
3. Number occupants?	Class room 25–30
4. Square feet floor surface per pupil?	15 square feet.
5. Cubic feet air space per pupil?	200 cubic feet.
6. Are adjustable seats used?	
7. Are they adjusted to fit the pupils?	
8. If seats are non-adjustable are footstools provided for children whose feet do not reach the floor?	
9. Is a well-ventilated, clean, dry cloakroom provided?	

CHECKING LIST SANITARY SURVEY (*Continued*)

Item	Standard
10. Is plenum or other system of artificial ventilation used?	2000 cu. ft. of air per pupil per hour.
11. Is it in good working order?	
12. Are some windows always open if it is out of order?	
13. If window ventilation is used are some windows always open?	
14. Are ventilating boards used under lower sash?	
15. Are rooms flushed with fresh air during intermissions?	
16. If room is heated by a stove is stove jacketed?	
17. Is cold air admitted at stove?	
18. Is a direct heating system employed?	
19. Is an indirect heating system employed?	Combination direct-indirect.
20. Are fresh air intakes remote from all sources of foul odors?	
21. Are entrances to intakes screened?	
22. Are halls clean and well lighted?	
23. Are they clear of obstructions?	
II. HEALTH CONDITIONS:	
1. Are rooms clean?	
2. Is sweeping compound or other substance used in sweeping?	
3. Has dry dusting been absolutely abandoned?	Moist cloth or dustless duster.
4. Method of lighting classroom?	Left side only.
5. Does light surface equal 20 to 25% of floor space?	
6. In redistributing pens and pencils does each pupil always get his own?	Should never be exchanged.
7. Are dustless crayons used?	
8. Are shades yellow or linen color?	
9. Are blackboards clean and black?	
10. Is air kept moist?	Humidity 40–60%.
11. Are rooms kept at proper temperature?	68–70°
12. Has the roller towel been abolished?	

CHECKING LIST SANITARY SURVEY (*Continued*)

Item	Standard
13. Is water supply pure?	
14. Are sanitary drinking fountains provided?	
15. Have common drinking cups been abolished?	
16. Are individual cups provided?	
17. Is water stored in a covered container?	
18. Is the container scalded daily?	
19. Does it have a spigot at bottom?	
III. SANITARY CONDITIONS:	
1. Are individual self-flushing toilets provided?	
2. Is the number adequate?	1 for 15 girls or 25 boys.
3. Are urinals of non-absorbent material adequate?	1 for ten boys.
4. Are toilets free of odors?	
5. Are seats washed daily with disinfecting solution?	
6. Are odors concealed by disinfectants?	None should be allowed.
7. Are toilets free from obscene marks?	
8. Are fixtures properly trapped?	
9. Are soil pipes carried through roof?	
10. Are paper holders provided?	
11. Are washing facilities supplied?	
IV. FIRE PROTECTION:	
1. Is a separate fire alarm installed?	
2. Are fire extinguishers supplied?	
3. Are iron fire escapes provided?	
4. Are fire drills conducted regularly?	
5. Are closets under stairways free from accumulations of rubbish?	
6. Are metal receptacles provided for inflammable material?	
7. Are furnace pipes properly insulated?	

CHAPTER XII

SCHOOL FINANCE

In view of the increasing cost of every element contributing to school expense, it is not strange that all municipalities are finding that the school budget increases more rapidly than the school enrollment. All salaries must be advanced because of the increased cost of living and the higher standards of teaching efficiency, and a broader curriculum and more supervision by experts add to the number of salaries. Books and school supplies, instead of being the property of the individual pupil, now come from the funds administered by the educational department. Buildings and equipment of the type once considered adequate no longer meet the public demand. The maintenance of activities formerly cared for by other agencies, but now delegated to the public school, represents additional expenditure. If the Board of Education is required to fulfil all these demands of the public, there must be an increase in the annual appropriation entrusted to it.

Lack of standards in educational costs, makes it impossible for the novice to determine the reasonableness of school expenditures, and in view of the complexity of the problem it is difficult for experts to reach a common agreement. Many elements complicate the question: the small, poor city cannot provide so generously for its schools as the larger, wealthy one; a city with a small

number of children to educate needs to spend less proportionately than a city with a larger ratio of children to adults; the homogeneous or heterogeneous character of the school population is another pertinent factor.

Educational needs determine what a city *ought* to spend; resources govern the amount that it *can* spend. The generally accepted practice represents not an educational goal, but rather a compromise between what is desirable and what is possible. Of the total amount raised by taxation the proportion devoted to school maintenance indicates the relative value which the community places upon education. Upon the school administration devolves the duty of so apportioning the funds to the various departments as to realize the highest possible returns from the expenditure.

The following tables are based upon prevailing practices in various cities. In the Cleveland Survey Dr. Ayres gives, for eighteen cities of from 250,000 to 750,000 inhabitants, the amount expended for schools in comparison with the estimated true value of all property assessed.

EXPENDITURES PER $1000 OF WEALTH, EIGHTEEN CITIES, 1914

City	Property Value	School Expenditures — Total	Expenditures per $1000 of Wealth
Baltimore, Md.....	$723,800,340	$1,954,670	$2.70
Boston, Mass.....	1,489,608,820	5,516,762	3.70
Buffalo, N.Y.	494,200,459	2,449,533	4.96
Cleveland, Ohio.....	756,831,185	3,569,504	4.72
Detroit, Mich.....	598,634,198	2,553,488	4.27
Indianapolis, Ind.....	363,413,650	1,409,504	3.88
Jersey City, N.J.	257,644,605	1,421,147	5.52
Kansas City, Mo.....	371,191,014	1,761,389	4.75
Los Angeles, Cal.....	836,604,260	3,706,519	4.43
Milwaukee, Wis.....	511,720,797	1,794,796	3.51

EXPENDITURES PER $1000 OF WEALTH (*Continued*)

City	Property Value	School Expenditures — Total	Expenditures per $1000 of Wealth
Minneapolis, Minn....	639,258,841	2,147,856	3.36
Newark, N.J.	383,864,182	2,699,239	7.03
New Orleans, La.....	314,086,036	1,097,552	3.49
Pittsburgh, Pa.....	789,035,200	3,602,303	4.57
San Francisco, Cal....	1,247,391,284	1,879,187	1.51
Seattle, Wash.....	473,174,995	1,750,998	3.70
St. Louis, Mo.....	1,125,308,749	4,084,693	3.63
Washington, D.C.	538,389,607	2,391,976	4.44
Average.....			4.12

The money a city can afford to spend for schools is determined by its real wealth. The great variation in

REAL WEALTH BEHIND EACH DOLLAR SPENT FOR SCHOOL MAINTENANCE [1]

City	Amount
Atlanta, Ga.....	$559.00
Los Angeles, Cal.....	538.00
Memphis, Tenn.....	449.00
Indianapolis, Ind.....	408.00
Spokane, Wash.....	370.00
Louisville, Ky.....	326.00
Bridgeport, Conn.....	276.00
Providence, R.I.	256.00
Albany, N.Y.	234.00
Rochester, N.Y.	225.00
Scranton, Pa.....	216.00
Dayton, Ohio.....	208.00
Grand Rapids, Mich.....	207.00
Fall River, Mass.....	196.00
Paterson, N.J.	185.00
New Haven, Conn.....	185.00
Worcester, Mass.....	180.00
Newark, N.J.	165.00

[1] Portland Survey.

the rate of assessment makes this the only proper basis of comparison between cities. The Portland Survey gives the amount of real wealth behind each dollar spent for school maintenance in a group of representative cities.

COMPARATIVE RATES OF TAX FOR SCHOOL MAINTENANCE IN MILLS BASED ON REAL WEALTH [1]

City	Tax in Mills
Newark, N.J.	.00606
Toledo, Ohio	.00543
New Haven, Conn.	.00541
Paterson, N.J.	.00541
Lowell, Mass.	.00515
Worcester, Mass.	.00505
Grand Rapids, Mich.	.00483
Scranton, Pa.	.00463
Columbus, Ohio	.00452
Albany, N.Y.	.00427
Bridgeport, Conn.	.00362
New Orleans, La.	.00315
Nashville, Tenn.	.00285
Spokane, Wash.	.00270
St. Paul, Minn.	.00244
Portland, Ore.	.00219
Richmond, Va.	.00186
Los Angeles, Cal.	.00184
Atlanta, Ga.	.00180

The basis for determining whether the school expenditure of any city is generous or illiberal appears in the per capita cost for schools as compared with the real wealth.

[1] Portland Survey.

WEALTH AND SCHOOL PER CAPITA EXPENDITURE[1]

City	Assessed Wealth per Capita	Basis of Assessment	Real Wealth per Capita	Per Capita Cost of Schools
Pueblo, Col.	$338.09	50	$676.18	$4.13
Sioux City, Ia.	189.64	25	758.56	6.91
Butte, Mont.	596.91	75	795.88	5.71
Des Moines, Ia.	232.15	25	928.60	7.26
Kansas City, Mo.	985.60	100	985.60	4.44
Wichita, Kan.	1028.72	100	1028.72	3.99
Lincoln, Neb.	212.76	20	1063.80	6.70
Colorado Springs, Col.	400.77	33	1202.31	7.64
Davenport, Ia.	605.14	50	1210.28	5.27
Topeka, Kan.	1126.82	90	1252.02	5.03
Berkeley, Cal.	822.68	60	1371.13	7.60
Salt Lake, Utah	589.23	36	1636.75	6.71
Pasadena, Cal.	1280.94	66	1921.41	10.11
Sacramento, Cal.	1042.03	50	2084.06	5.72
San Diego, Cal.	1051.05	39	2695.00	6.01

Wealth alone does not suffice to determine what constitutes a reasonable school expenditure. It must be considered in connection with the number of children to be educated. The following table, when compared with the preceding one, shows this relation.

The three cities of Lincoln, Neb., San Diego, Cal., and Des Moines, Iowa, may be taken as illustrating the application of these tables. In each case the amount expended for one per cent of the children in the population is .44. This fact if taken by itself would lead to the expectation of finding the same unanimity in the amount from which the support of the local schools is drawn. By reference to the first table it appears that the actual

[1] Topeka Report, 1915.

SCHOOL EXPENDITURE AND PER CENT OF POPULATION 5–15 YEARS OF AGE

City	Cost per Capita for Schools	Per Cent of Population 5–15 Years	Cost for Each 1 % Children in Population
Pueblo, Col.	$4.13	16.4	.25
Wichita, Kan.	3.99	15.4	.25
Kansas City, Mo.	4.44	16.8	.26
Davenport, Ia.	5.27	16.7	.31
Topeka, Kan.	5.03	15.5	.32
Butte, Mont.	5.71	15.1	.37
Salt Lake, Utah	6.71	18.3	.37
Lincoln, Neb.	6.70	15.3	.44
San Diego, Cal.	6.01	13.4	.44
Des Moines, Ia.	7.26	16.5	.44
Sacramento, Cal.	5.72	12	.48
Colorado Springs	7.64	16	.48
Berkeley, Cal.	7.60	14.7	.51
Sioux City, Ia.	6.91	12	.58
Pasadena, Cal.	10.11	13.6	.74
Median			.44

wealth per capita in Lincoln is $1063, in San Diego $2695, and in Des Moines $928. On this showing Des Moines is nearly three times as generous as San Diego in supporting public education. At the same time Des Moines has the heaviest burden of the three cities in the proportion of its 5–15 year old children to the entire population.

In fixing any standard for school expenditure due consideration must be given to the claims of other civic departments. In the Salt Lake City Survey Dr. Cubberly shows the relation between the cost of schools and city maintenance.

PER CAPITA COST FOR CITY MAINTENANCE INCLUDING INTEREST CHARGES AND PER CAPITA AND PERCENTAGE AMOUNTS FOR SCHOOLS, WESTERN CITIES

City	Maintenance	Per Capita for Schools	Per Cent for Schools
San Francisco, Cal...	$36.09	$4.27	11.9%
Portland, Ore.....	17.71	4.73	26.7
Tacoma, Wash.....	19.99	4.95	24.7
Seattle, Wash.....	22.15	5.06	24.8
Spokane, Wash.....	18.87	5.41	29.7
Butte, Mont.....	18.25	5.71	31.6
Denver, Colo.....	21.00	5.72	28.6
Sacramento, Cal.....	17.49	5.72	32.7
Oakland, Cal.....	17.77	5.74	32.5
San Diego, Cal.....	22.44	6.01	26.8
San Jose, Cal.....	14.91	6.26	42
Salt Lake, Utah.....	17.17	6.71	39.1
Berkeley, Cal.....	14.74	7.60	51.3
Colorado Springs....	19.63	7.64	38.9
Los Angeles, Cal.....	26.17	8.66	31.9
Pasadena, Cal.....	23.38	10.11	43.3
Average for group..	$20.48	$6.27	32.3%
Median for group..	19.27	5.73	31.8

From the above table it appears that in the percentage of the total amount raised by taxation which is devoted to school maintenance, San Diego falls considerably below the median. This fact makes our previous comparison between Des Moines and San Diego in the matter of school support even more creditable to the former city.

The same facts are given for smaller cities, located largely in the central and eastern sections of the country.

PER CAPITA COST FOR CITY MAINTENANCE AND PER CAPITA AND PERCENTAGE AMOUNTS FOR SCHOOLS

City	Total Maintenance Cost per Capita	Cost per Capita for Schools	Per Cent of Total for Schools
Reading, Pa.	$9.33	$3.13	33.6
Bridgeport, Conn.	13.24	3.29	24.8
Lowell, Mass.	14.72	3.99	27.1
Lynn, Mass.	15.63	4.02	25.8
Lawrence, Mass.	14.40	4.07	28.2
Dayton, Ohio	14.46	4.15	28.7
Fall River, Mass.	14.99	4.16	27.8
Albany, N.Y.	17.10	4.17	24.4
Kansas City, Mo.	13.10	4.22	32.2
Troy, N.Y.	18.40	4.24	23.1
Youngstown, Ohio	11.86	4.37	36.8
New Bedford, Mass.	18.57	4.41	23.8
Trenton, N.J.	14.88	4.85	32.6
Camden, N.J.	13.83	4.90	35.5
Tacoma, Wash.	19.99	4.95	24.8
Omaha, Neb.	20.82	4.99	24
Somerville, Mass.	17.83	5.04	18.4
Cambridge, Mass.	22.30	5.14	23.5
Grand Rapids, Mich.	13.81	5.21	37.8
Duluth, Minn.	17.22	5.24	30.2
Spokane, Wash.	18.87	5.41	29.7
Yonkers, N.Y.	22.69	6.22	27.4
Hartford, Conn.	20.94	6.26	30
Salt Lake, Utah	17.17	6.71	39.1
Springfield, Mass.	22.55	7.07	31.3
Des Moines, Ia.	16.86	7.26	33.6
Average for group	$16.75	$4.90	29
Median for group	16.98	4.88	28.5

The distribution of the total amount raised by taxation among the different city departments shows which ones ought to retrench if revenues fail to equal expenditures.

DISTRIBUTION OF EXPENDITURES, SIXTEEN WESTERN CITIES [1]

Item	Per Capita Cost	
	Average	Median
General Expenses	$1.84	$1.52
Police Department	1.74	1.47
Fire Department	1.76	1.61
Health and Sanitation	1.49	1.45
Care of Streets	2.09	2.10
Charities and Corrections	.30	.11
Schools	6.27	5.73
Libraries	.34	.35
Parks and Playgrounds	.59	.51
Miscellaneous	.92	.23
Total per capita cost	$17.34	$15.08
Interest on public debt	3.06	2.70
Total per capita rate	$20.40	$17.78

The Portland Survey gives a similar table for thirty-seven cities in different parts of the country.

ITEMS OF CITY EXPENDITURE THIRTY-SEVEN CITIES

Item	Average per Capita
General Expenses	$1.30
Police Department	1.54
Fire Department	1.64
Inspection Service	.19
Health Conservation	.29
Street Cleaning and Sanitation	1.10
Care and Lighting of Streets	1.70
Charities and Correction	.74
Education	4.23
Libraries and Museums	.22
Parks and Playgrounds	.44
Miscellaneous	.14
Total per capita cost	$13.53
Interest on debt	2.54
Total per capita rate	$16.07

[1] Salt Lake City Survey.

In the report of the Brookline, Mass., survey, the percentage of distribution among the principal departments of the total amount raised by taxation is given for a group of representative cities:

PERCENTAGE DISTRIBUTION OF EXPENSES OF MUNICIPAL GOVERNMENTS

Cities	General Government	Protection Persons and Property	Health	Highways	Charities	Schools	Libraries	Recreation	Miscellaneous
Berkeley, Cal.	8.3	18.8	5.1	8.8	1.2	53.5	2.4	1.8	.1
Pasadena, Cal.	7.5	12.6	8.6	14.4	1	46.3	2.5	5.7	1.5
San Diego, Cal.	2.7	23	6.7	16	...	33.9	1.7	6	3.6
Brookline, Mass.	6.9	23.3	12	18.7	2	23.8	3	8.9	1.4
Newton, Mass.	6.9	15.9	11.6	13.4	3.3	35.5	2.8	8.8	.8
Springfield, Mass.	5.3	23	9.8	12.5	3.6	33.6	2.6	3.9	5.5
East Orange, N.J.	7	18.3	13	13	1.3	41.5	2.5	2.2	1.2
New Rochelle, N.Y.	12.9	15	10.3	12.1	4.1	38.1	1.7	4.5	1.1
Yonkers, N.Y.	12	22.4	13.9	11.6	6.1	30.8	.6	1.2	1.2
Cities with a population 50,000	8.7	21.2	8.7	13.2	3.8	38.5	1.5	2.7	1.7
Boston, Mass.	9.6	20.9	11.4	11.4	9.4	25.3	1.8	6	4.1
Los Angeles, Cal.	12.6	15.9	6.6	17.5	5	35	1.3	3	3.1

Ten cities in Connecticut, New York, and New Jersey make the following percentage distribution of their funds.[1]

Item	Average per Cent
Schools	37.5
General Government	9
Police	9.1
Fire Protection	11.4
Other Protection	1
Health	1.7
Sanitation	7.4
Highways	13.7
Charities and Correction	3.5
Libraries	1.5
Recreation	2.4
Miscellaneous	.5
General	1.3

The annual pupil cost when interpreted in the light of the preceding tables becomes of great significance. The Cleveland Survey Report presents figures comparing the amounts spent per child in average daily attendance for operation and maintenance, and for annual improvements over the four year period 1911–1914 inclusive.

MAINTENANCE AND IMPROVEMENT COSTS PER CAPITA, 1914

City	Maintenance	New Buildings, Grounds and Equipment
Baltimore, Md.	$32.54	$8.93
Boston, Mass.	56.73	11.39
Buffalo, N. Y.	51.32	27.78
Cleveland, Ohio	46.38	13.81
Detroit, Mich.	44.66	17.73

[1] Stamford, Connecticut Report, 1916.

MAINTENANCE AND IMPROVEMENT COSTS PER CAPITA (*Continued*)

City	Maintenance	New Buildings, Grounds and Buildings
Indianapolis, Ind.	46.59	9.98
Jersey City, N.J.	43.17	16.63
Kansas City, Mo.	52.96	21.57
Los Angeles, Cal.	64.78	16.49
Milwaukee, Wis.	38.51	7.60
Minneapolis, Minn.	52.70	18.84
Newark, N.J.	50.25	19.19
New Orleans, La.	33.07	4.93
Pittsburgh, Pa.	58.97	12.13
San Francisco, Cal.	45.08	34.89
Seattle, Wash.	61.18	18.54
St. Louis, Mo.	52.40	10.86
Washington, D.C.	51.34	11.31
Average	49.04	15.70

Because of the carelessness of local officials in distributing expenditures, a certain degree of inaccuracy is likely to occur in comparative statistics of this character. If a comparison is made with the average cost of all cities rather than with any single city, this error is minimized; because the city which has included too much under one category is offset by the city including too little in the same account. Whether the amount received for schools be large or small, the necessity for its equitable distribution is self-apparent. Some expenditures, such as those for teachers' salaries and books, cannot be curtailed without directly lowering school efficiency, so the proper apportionment of funds is of extreme importance. The following table from the Salt Lake City Survey attempts to furnish a guide.

DISTRIBUTION OF SCHOOL EXPENDITURE IN PER CENTS — 16 CITIES

Item	Average	Median	Highest	Lowest
Administration	3.3	3	4.6	1.8
Supervision	9.1	9.7	15.3	3.4
Teachers' Salaries	67.2	64.8	71.6	60
Janitors and Labor	5.9	5.5	10.8	4.2
Textbooks and Supplies	5.4	4.8	11.9	1.6
Fuel, Power, Water etc.	3.7	3.5	8	1.2
Maintenance and Repairs	6	5.7	12.1	3.1
Health Conservation	.4	.2	1.2	.0
Miscellaneous	.5	1.9	2.7	.0

Based on the practice in twelve eastern cities the actual distribution of a total expenditure of $40.28 is as follows.

AVERAGE PER CAPITA EXPENDITURE IN TWELVE EASTERN CITIES

Purpose	Amount	Per Cent
Salaries of Teachers	$25.88	64.2%
Principals	2.95	7.3
Janitors and Engineers	2.85	7.1
Repairs	2.28	5.6
Fuel	1.46	3.6
Supplies	1.39	3.4
Board of Education Office	.85	2.1
Supervisors	.73	1.8
Light and power	.73	1.8
Superintendent's Office	.63	1.5
Other Expenses	.53	1.3
Total	$40.28	

From the nature of its organization, the expenditure for the high school must exceed that of the elementary school, but unless reasonable care is exercised the former will absorb more than its share of the available funds. Although the principle of the free high school is firmly established in this country, it should not be forgotten

that many pupils will never receive a secondary school education, and thus to allow a disproportionate amount to the high schools at the expense of the elementary schools is an unsound educational policy.

DISTRIBUTION OF MAINTENANCE COSTS BETWEEN ELEMENTARY AND HIGH SCHOOLS, BASED ON AVERAGE DAILY ATTENDANCE

City	Pupil per Capita High School	Pupil per Capita Elementary School	Per Cent Attendance High School
Springfield, Ill.	$66.49	$38.44	
New Britain, Conn.	68.13	27.90	
Malden, Mass.	69.13	31.56	
Tacoma, Wash.	71.80	37.07	15
Omaha, Neb.	75.11	35.56	11
Portland, Ore.	76.42	41.95	12
Holyoke, Mass.	77.19	39.34	
Salt Lake, Utah	78.89	41.79	9
San Jose, Cal.	80.33	38.16	21
Oakland, Cal.	80.94	42.53	13
Kansas City, Mo.	82.30	34.88	14
Denver, Colo.	82.78	38.12	13
Minneapolis, Minn.	84.83	42.31	14
Montclair, N.J.	85.38	56.17	18
Pueblo, Colo.	86.73	34.30	12
Spokane, Wash.	92.56	44.33	14
Los Angeles, Cal.	120.07	50.38	15
Seattle, Wash.	101.14	43.92	16
Bayonne, N.J.	102.66	36.40	
San Diego, Cal.	104.06	42.91	15

A statistical study of school reports made by J. T. Giles, of Richmond, Indiana, gives in convenient form the comparative expenditure for elementary schools and high schools in twenty-five cities of Indiana which have a population of more than 10,000.

COMPARATIVE EXPENDITURES ELEMENTARY AND HIGH SCHOOLS

Rank	Column I City	Column I Ratio	Column II City	Column II Ratio	Column III City	Column III Ratio	Column IV City	Column IV Ratio	Column V City	Column V Ratio
1.....	U	58	H	94	Y	90	I	45.63	S	85.70
2.....	J	51	Y	94	T	89	C	32.24	H	79.79
3.....	S	48	T	90	X	88	H	31.05	V	77.92
4.....	W	47	G	90	G	88	D	30.67	B	75.04
5.....	X	45	P	88	U	86	N	30.49	N	74.04
6.....	K	44	I	87	O	85	E	29.81	U	72.41
7.....	M	44	X	87	Q	83	A	29.80	C	72.26
8.....	N	41	U	87	J	81	B	28.45	D	68.82
9.....	V	39	C	86	P	81	W	28.43	E	67.47
10.....	F	39	O	83	S	81	L	27.55	A	67.12
11.....	Q	37	R	82	A	78	F	27.48	I	66.98
12.....	C	37	Q	81	E	78	P	27.20	T	58.76
13.....	R	35	N	79	K	78	T	26.41	J	57.02
14.....	D	33	F	77	C	76	V	24.57	F	56.83
15.....	Y	31	B	76	V	76	S	24.52	K	55.55
16.....	B	31	M	76	W	76	J	23.72	M	55
17.....	L	31	L	76	D	76	G	23.18	Y	52
18.....	P	31	J	74	F	75	U	23.11	W	50.93
19.....	A	30	W	73	R	73	K	22.18	L	49.26
20.....	E	30	A	71	B	71	Q	21.50	Q	47.19
21.....	O	27	E	68	H	71	M	20.63	X	43.91
22.....	T	27	V	67	L	70	X	20.26	G	41.18
23.....	G	25	S	66	M	68	Y	19.11	R	41.09
24.....	H	20	K	65	N	66	O	18.96	O	39.53
25.....	I	13	D	53	I	54	R	18.65	P	39.28

EXPLANATION OF TABLE

Column I shows the ratio of total high school expenditure to total grade expenditure; illustration, City U spends 58 per cent as much for high school as for grades. The median is 35 per cent.

Column II shows the ratio of the amount paid for teaching in high school to total cost in high school; illustration, City H spends 94 per cent of total expenditure for teaching. The median is 79 per cent.

Column III shows similar facts for the grades; illustration, City Y devotes 90 per cent of total grade expenditure to teaching. The median is 78 per cent.

Column IV shows the average annual cost per pupil enrolled in the grades; illustration, the annual cost in City I for each elementary school pupil is $45.63. The median is $26.41.

Column V shows the same facts for high school pupils; illustration, the annual cost in City S for each high school pupil is $85.70. The median is $57.02.

In making a careful analysis of school expenses it is often desirable to know the exact cost of various items of school expenditure. The superintendent may wish to decide whether the school system is paying more for supervision than it can afford; or possibly the suggestion is made that a reduction in expenses be effected by curtailing the expenditure for books or supplies. In some instances carelessness on the part of the janitors has resulted in an excessive cost for light. Inefficient engineers and firemen, through a wastage of coal, cause an unreasonable expense. When the demand is made for economy in school expenditure it is a mistaken policy to reduce the appropriation on no better basis than mere opinion. A certain standard of service requires proportionate cost, and if this is reduced it may be at the expense of efficiency. The only satisfactory method for determining whether or not the cost of any item or any activity is reasonable is to make a comparison of the local cost with similar service in other school systems. In doing this the larger the number of systems entering into the calculation the more accurate the conclusion, since excessive cost in one case is neutralized by the low cost in another. The average, or the median, is always a safer base to use than any single instance. To enable a superintendent to check up the details of the local budget, the important items are presented in the following tables:

CLASSIFIED EXPENDITURES PER CHILD IN AVERAGE DAILY ATTENDANCE FOR CLEVELAND AND FOR SEVENTEEN OTHER CITIES OF FROM 25,0000 TO 750,000 INHABITANTS [1]

City	Office, Board and Other Business Offices	Superintend. Office	Salaries and Expenses of Supervision	Salaries and Expenses of Principals	Salaries of Teachers	Stationery, Supplies and Other Inst. Expenses	Wages, Janitor and Other Employees	Fuel	Maintenance, Repairs, Replacements, etc.
Baltimore.....	$ .28	$ .63	$ .14	$2.54	$22.65	$ .94	$2.42	$1.03	$ .48
Boston.....	1.89	1.11	.88	3.29	36.54	1.55	3.42	1.31	3.82
Buffalo.....	.36	.76	.65	3.34	31.95	2.07	3.25	1.54	4.28
Cleveland.....	1.86	.52	.59	2.25	29.44	.84	3.93	1.34	2.97
Detroit.....	.54	.11	.74	3.61	30.09	1.34	4.18	1.20	1.73
Indianapolis...	1.18	.74	1.59	2.33	27.74	1.65	2.93	1.52	2.32
Jersey City...	.43	1.08	.46	3.38	28.26	1.37	2.70	1.15	1.53
Kansas City ..	2.08	1.09	.58	4.31	32.47	1.24	2.80	1.74	1
Los Angeles...	2.24	.77	1.21	5.16	45.44	1.85	2.86	.44	2.65
Milwaukee....	.39	.71	.32	3.06	27.38	.99	2.21	1.11	...c
Minneapolis...	.61	.43	.64	3.14	34.55	2.10	3.11	1.81	3.75
Newark.....	1.12	.96	.75	3.69	33.96	1.99	2.88	.91	.87
New Orleans..	.57	.39	.21	2.19	24.64	...c	1.60	.37	1.23
Pittsburgh....	2.88	1.27	1.52	4.56	31.84	2.39	4.80	1.52	4.71
San Francisco.	.78	.44	.29	4.35	34.09	1.35	3.01	.19	...c
Seattle.....	.74	.94	.43	.17[2]	44.96[2]	2.22	4.11	1.43	2.08
St. Louis.....	2.45	1.04	.85	3.51	30.03	1.37	3.39	.57	6.40
Washington...	.33	.52	.78	2.25	36.97	1.25	2.86	1.60	2.36
Average....	$1.15	$ .75	$ .70	$3.17	$32.39	$1.56	$3.14	$1.15	$2.64

[1] Cleveland Survey, 1914

[2] Expenses only. Salaries of principals included in salaries of teachers.

One of the most recent investigations of school costs appears in the report of the School Survey of Brookline, Massachusetts, made under the direction of Dr. James Van Sickle, Superintendent of Schools, Springfield, Massachusetts. These figures were compiled from unpublished data in the office of the United States Commissioner of Education and represent an average for the years 1914–1915 and 1915–1916. The number of pupils in average daily attendance is used as the divisor.

Based as these tables are, upon the figures from seventeen selected cities and representing in each case an average for two years, they furnish a very definite basis of comparison for any superintendent.

SEVENTEEN SELECTED CITIES

AVERAGE EXPENSES OF GENERAL CONTROL PER CAPITA OF AVERAGE DAILY ATTENDANCE IN DAY SCHOOLS FOR YEARS 1914–15 AND 1915–16

1. Montclair	$3.55	11. Pasadena	$2.04
2. Milton	3.36	12. Newton	1.99
3. Wellesley	3.27	13. New Rochelle	1.98
4. Colorado Springs	2.77	14. Springfield	1.94
5. White Plains	2.72	15. Yonkers	1.83
6. Evanston	2.67	16. Berkeley	1.48
7. Brookline	2.62	17. Oak Park	1.41
8. San Diego	2.41		
9. East Orange	2.35	Boston	3.05
10. Madison	2.17	Los Angeles	3.68

AVERAGE EXPENSES OF ELEMENTARY SCHOOLS PER CAPITA OF AVERAGE DAILY ATTENDANCE FOR YEARS 1914–15 AND 1915–16

1. Montclair	$77.90	6. Berkeley	55.20
2. Pasadena	65.03	7. Milton	53.13
3. Brookline	62.84	8. San Diego	50.19
4. Evanston	55.38	9. White Plains	46.91
5. Wellesley	55.35	10. Newton	46.72

11. Oak Park	$46.51	16. Yonkers	43.96
12. Colorado Springs	46.39	17. Madison	37.37
13. East Orange	46.24		
14. New Rochelle	45.49	Boston	45.54
15. Springfield	44.79	Los Angeles	60.11

AVERAGE EXPENSES OF SECONDARY SCHOOLS PER CAPITA OF AVERAGE DAILY ATTENDANCE FOR YEARS 1914–15 AND 1915–16 IN GROUP OF FIFTEEN SELECTED CITIES

1. Pasadena	$139.50	10. Wellesley	$85.26
2. San Diego	123.79	11. Colorado Springs	76.92
3. Brookline	116.80	12. Yonkers	75.85
4. Springfield	106.92	13. Newton	74.38
5. New Rochelle	98.40	14. Madison	66.91
6. Montclair	93.70	15. Milton	58.68
7. East Orange	93.43		
8. White Plains	92.39	Boston	83.21
9. Berkeley	91.04	Los Angeles	157.09

PROPORTION OF TOTAL EXPENSES EXPENDED FOR GENERAL CONTROL, ELEMENTARY SCHOOLS AND SECONDARY SCHOOLS

Cities	General Control	Elementary Schools	Secondary Schools
Milton	2.8	46.1	51.1
Wellesley	2.3	38.5	59.2
Colorado Springs	2.2	36.8	61.1
Montclair	2	44.5	53.5
Madison	2	35.2	62.8
White Plains	1.9	33.1	65
East Orange	1.6	32.6	65.8
Newton	1.6	38	60.4
Yonkers	1.5	36.2	62.3
Brookline	1.4	34.4	64.2
New Rochelle	1.4	31.2	69.4
San Diego	1.3	28,8	69.9
Springfield	1.1	28.7	70.2
Berkeley	1	37.4	61.6
Pasadena	1	31.5	67.5
Median	1.6	35.2	62.8
Boston	2.3	34.6	63.1
Los Angeles	1.7	27.2	71.1

AVERAGE COST PER PUPIL FOR YEARS 1914–15 AND 1915–16 OF VARIOUS CLASSES OF EXPENSES OF ELEMENTARY SCHOOLS ARRANGED IN ORDER OF THEIR AMOUNTS

(a) SALARIES AND EXPENSES OF SUPERVISORS

1. Milton	$5.38 [1]
2. Montclair	4.83
3. Oak Park	3.88
4. White Plains	3.49
5. San Diego	2.76
6. Evanston	2.75
7. Wellesley	2.15
8. Newton	1.74
9. Berkeley	1.41
10. Colorado Springs	1.31
11. Springfield	1.13
12. New Rochelle	1.12
13. Madison	1
14. Brookline	.98
15. East Orange	.94
16. Yonkers	.64
17. Pasadena	
Boston	.66
Los Angeles	1.43

(b) SALARIES AND EXPENSES OF PRINCIPALS

1. Brookline	$6.63
2. Pasadena	6.63
3. East Orange	5
4. Colorado Springs	4.63
5. Yonkers	4.14
6. Berkeley	4.12
7. San Diego	4.03
8. New Rochelle	3.99
9. Madison	3.77
10. Newton	3.65
11. Montclair	3.55
12. Springfield	2.65
13. Wellesley	2.03
14. White Plains	1.67
15. Oak Park	1.22
16. Evanston	.27
17. Milton	
Boston	2.61
Los Angeles	5.10

(c) SALARIES OF TEACHERS IN ELEMENTARY SCHOOLS

1. Pasadena	$44.37
2. Montclair	43.33
3. Berkeley	38.81
4. Brookline	35.51
5. Wellesley	33.26
6. San Diego	32.14
7. Evanston	31.66
8. Milton	30.47
9. Yonkers	29.80
10. New Rochelle	29.27
11. White Plains	29.26
12. Colorado Springs	29

(d) TEXTBOOKS — ELEMENTARY SCHOOLS

1. White Plains	$1.39
2. Wellesley	1.19
3. Brookline	1.14
4. Montclair	.97
5. Springfield	.94
6. East Orange	.91
7. Yonkers	.82
8. Milton	.71
9. Newton	.66
10. New Rochelle	.62
11. Colorado Springs	.50
12. Evanston	.19

[1] Includes principals.

13. East Orange	28.88	13. Madison	.10
14. Springfield	28.06	14. Pasadena	
15. Newton	27.97	15. Berkeley	
16. Oak Park	27.56	16. San Diego	
17. Madison	21.50	17. Oak Park	
Boston	30.42	Boston	.74
Los Angeles	40.44	Los Angeles	

(e)

STATIONERY, SUPPLIES AND OTHER EXPENSES OF INSTRUCTION

1. Montclair	$4.39
2. Evanston	3.54
3. White Plains	2.72
4. San Diego	2.46
5. Berkeley	2.44
6. Springfield	2.32
7. Brookline	1.85
8. Wellesley	1.74
9. Pasadena	1.74
10. Milton	1.72
11. Colorado Springs	1.65
12. Oak Park	1.45
13. East Orange	1.44
14. New Rochelle	1.26
15. Yonkers	1.04
16. Newton	1.01
17. Madison	.76
Boston	1.24
Los Angeles	1.52

(f)

WAGES OF JANITORS

1. Montclair	$6.10
2. Brookline	5.40
3. Milton	5.31
4. Wellesley	4.83
5. Evanston	4.78
6. Oak Park	4.36
7. Pasadena	3.69
8. New Rochelle	3.68
9. East Orange	3.44
10. Berkeley	3.37
11. Newton	3.26
12. Springfield	3.18
13. White Plains	2.92
14. San Diego	2.90
15. Yonkers	2.84
16. Colorado Springs	2.61
17. Madison	2.59
Boston	3
Los Angeles	3.11

(g)

HEAT, LIGHT, WATER, POWER AND JANITORS' SUPPLIES

1. Evanston	$4.86
2. Montclair	4.74
3. Brookline	4.74
4. Milton	4.35
5. Oak Park	4.19
6. Wellesley	3.74
7. Madison	3.51
8. Springfield	3.39

(h)

MAINTENANCE (REPAIRS AND REPLACEMENTS)

1. Evanston	$6.31
2. Newton	4.76
3. Montclair	4.65
4. Brookline	4.44
5. Pasadena	4.39
6. Berkeley	3.44
7. San Diego	3.40
8. Oak Park	3.09

(*g*) (*Continued*)

9.	New Rochelle	2.98
10.	Colorado Springs	2.67
11.	White Plains	2.42
12.	East Orange	2.40
13.	Newton	2.32
14.	Pasadena	1.68
15.	Yonkers	1.66
16.	Berkeley	1.20
17.	San Diego	1.13
	Boston	1.98
	Los Angeles	1.17

(*h*) (*Continued*)

9.	Colorado Springs	2.98
10.	Springfield	2.71
11.	Milton	2.47
12.	Wellesley	2.47
13.	East Orange	2.46
14.	Yonkers	2.26
15.	Madison	2.22
16.	White Plains	2.20
17.	New Rochelle	2.11
	Boston	3.20
	Los Angeles	2.94

(*i*)
LIBRARIES

1.	Pasadena	$ .83
2.	San Diego	.56
3.	Oak Park	.45
4.	Berkeley	.40
5.	Evanston	.14
6.	Wellesley	.12
7.	White Plains	.08
8.	Yonkers	.06
9.	Montclair	.05
10.	New Rochelle	.03
11.	Colorado Springs	.02
12.	Madison	.01
13.	East Orange	.01
14.	Springfield	
15.	Yonkers	
16.	Brookline	
17.	Newton	
	Boston	
	Los Angeles	.40

(*j*)
PROMOTION OF HEALTH

1.	Montclair	$1.27
2.	Milton	.82
3.	Newton	.76
4.	Brookline	.75
5.	San Diego	.63
6.	Evanston	.62
7.	Pasadena	.61
8.	East Orange	.48
9.	Yonkers	.44
10.	Wellesley	.39
11.	Berkeley	.38
12.	Madison	.34
13.	White Plains	.28
14.	Colorado Springs	.26
15.	New Rochelle	.25
16.	Oak Park	.19
17.	Springfield	
	Boston	.43
	Los Angeles	.39

(*k*)

TRANSPORTATION OF PUPILS

1.	Wellesley	$1.68
2.	Madison	1.59
3.	San Diego	.98
4.	Brookline	.78

(*l*)
MISCELLANEOUS, INCLUDING PAYMENTS TO OTHER SCHOOLS, PENSIONS, RENT, ETC.

1.	Montclair	$3.82
2.	Wellesley	1.68
3.	Madison	1.59
4.	Pasadena	1.10

5.	Colorado Springs	.76	5.	San Diego	.98
6.	White Plains	.48	6.	Brookline	.90
7.	Evanston	.26	7.	Colorado Springs	.76
8.	East Orange	.21	8.	White Plains	.48
9.	New Rochelle	.18	9.	Evanston	.26
10.	Newton	.15	10.	East Orange	.21
11.	Berkeley	.13	11.	New Rochelle	.18
12.	Oak Park	.12	12.	Newton	.15
13.	Montclair	.03	13.	Berkeley	.13
14.	Springfield		14.	Oak Park	.12
15.	Yonkers		15.	Springfield	
16.	Milton		16.	Yonkers	
17.	Pasadena		17.	Milton	
	Boston	.01		Boston	1.25
	Los Angeles	.02		Los Angeles	3.61

The following table furnishes the data relating to the percentage distribution of expenses in elementary schools.

PROPORTION OF TOTAL EXPENSES OF ELEMENTARY SCHOOLS EXPENDED FOR EACH CLASS OF EXPENSES IN FIFTEEN SELECTED CITIES IN THE YEARS 1914–15 AND 1915–16, ARRANGED IN ORDER OF THEIR AMOUNTS[1]

	(a) SALARIES AND EXPENSES OF SUPERVISORS		(b) SALARIES AND EXPENSES OF PRINCIPALS	
1.	Milton	10.1	Brookline	10.6
2.	White Plains	7.4	Pasadena	10.3
3.	Montclair	6.2	Madison	10.1
4.	San Diego	5.4	Colorado Springs	10
5.	Wellesley	3.9	Yonkers	9.4
6.	Newton	3.7	New Rochelle	8.8
7.	Colorado Springs	2.8	San Diego	7.9
8.	Madison	2.7	Newton	7.8
9.	Berkeley	2.6	Berkeley	7.5
10.	New Rochelle	2.5	Springfield	5.9
11.	Springfield	2.5	Montclair	4.6
12.	East Orange	2.4	Wellesley	3.7
13.	Brookline	1.6	White Plains	3.6
14.	Yonkers	1.5	East Orange	1.1
15.	Pasadena		Milton	

[1] Evanston and Oak Park, Ill., are not included because their high schools are not a part of the city system of schools and data relating to them are not available.

(c)
SALARIES OF TEACHERS

1.	Berkeley	69.4
2.	Pasadena	68.3
3.	Yonkers	67.7
4.	New Rochelle	64.3
5.	Springfield	62.6
6.	Colorado Springs	62.5
7.	East Orange	62.5
8.	White Plains	62.4
9.	San Diego	60.3
10.	Wellesley	60
11.	Newton	59.9
12.	Madison	57.5
13.	Milton	57.4
14.	Brookline	56.6
15.	Montclair	55.8

(d)
TEXTBOOKS

1.	White Plains	3
2.	Wellesley	2.2
3.	Springfield	2.1
4.	Yonkers	1.9
5.	Brookline	1.8
6.	Newton	1.4
7.	New Rochelle	1.4
8.	Milton	1.3
9.	Montclair	1.3
10.	Colorado Springs	1.1
11.	Madison	.3
12.	East Orange	.2
13.	Pasadena	
14.	Berkeley	
15.	San Diego	

(e)
STATIONERY, SUPPLIES AND OTHER EXPENSES OF INSTRUCTION

1.	White Plains	5.8
2.	Montclair	5.6
3.	Springfield	5.2
4.	Milton	4.8
5.	Berkeley	4.4
6.	Colorado Springs	3.6
7.	Wellesley	3.2
8.	Milton	3.2
9.	East Orange	3.1
10.	Brookline	2.9
11.	New Rochelle	2.8
12.	Pasadena	2.7
13.	Yonkers	2.4
14.	Newton	2.2
15.	Madison	2.1

(f)
WAGES OF JANITORS

1.	Milton	10
2.	Wellesley	8.7
3.	Brookline	8.6
4.	New Rochelle	8.1
5.	Montclair	7.9
6.	East Orange	7.5
7.	Springfield	7.1
8.	Newton	7
9.	Madison	6.9
10.	Yonkers	6.5
11.	White Plains	6.2
12.	Berkeley	6.1
13.	Pasadena	5.7
14.	San Diego	5.7
15.	Colorado Springs	5.6

(g)
HEAT, LIGHT, WATER, POWER AND JANITORS' SUPPLIES

1.	Madison	9.4
2.	Milton	8.2
3.	Springfield	7.6
4.	Brookline	7.1

(h)
MAINTENANCE (REPAIRS AND REPLACEMENT)

1.	Newton	10.2
2.	Brookline	7.1
3.	Pasadena	6.8
4.	San Diego	6.7

5. Wellesley	6.8
6. New Rochelle	6.6
7. Montclair	6.1
8. Colorado Springs	5.8
9. East Orange	5.2
10. White Plains	5.2
11. Newton	5
12. Yonkers	3.8
13. Pasadena	2.6
14. Berkeley	2.2
15. San Diego	2.2

(i)
LIBRARIES

1. Pasadena	1.3
2. San Diego	1.1
3. Berkeley	.7
4. Wellesley	.2
5. White Plains	.2
6. Montclair	.1
7. New Rochelle	.1
8. Yonkers	.1
9. Colorado Springs	
10. East Orange	
11. Madison	
12. Brookline	
13. Milton	
14. Newton	
15. Springfield	

(k)

TRANSPORTATION OF PUPILS

1. Milton	3.6
2. Wellesley	3.2
3. Brookline	1.2
4. Newton	1
5. Yonkers	.7
6. East Orange	.2
7. Montclair	
8. Pasadena	
9. Berkeley	
10. San Diego	

5. Colorado Springs	6.4
6. Berkeley	6.2
7. Springfield	6.1
8. Montclair	6
9. Madison	6
10. East Orange	5.3
11. Yonkers	5.2
12. Milton	4.7
13. White Plains	4.7
14. New Rochelle	4.6
15. Wellesley	4.5

(j)
PROMOTION OF HEALTH

1. Montclair	1.6
2. Milton	1.6
3. Newton	1.6
4. East Orange	1.4
5. Brookline	1.2
6. San Diego	1.2
7. Yonkers	1
8. Pasadena	.9
9. Madison	.9
10. Wellesley	.7
11. Berkeley	.7
12. White Plains	.6
13. Colorado Springs	.6
14. New Rochelle	.6
15. Springfield	

(l)
MISCELLANEOUS, INCLUDING PAYMENT TO OTHER SCHOOLS, PENSIONS, RENT, ETC.

1. Montclair	4.9
2. Madison	4.3
3. Wellesley	3.1
4. San Diego	1.9
5. Pasadena	1.7
6. Colorado Springs	1.6
7. Brookline	1.4
8. White Plains	1
9. East Orange	.5
10. New Rochelle	.4

(k) (*Continued*)	(l) (*Continued*)	
11. White Plains	11. Newton	.3
12. Colorado Springs	12. Berkeley	.2
13. New Rochelle	13. Milton	
14. Springfield	14. Springfield	
15. Madison	15. Yonkers	

Taking the median proportions in these classes of expenses as the standards which joined together represent an ideal group standard for distribution of expenses, we can have by expressing the deviations of any expense from its standard in terms of the percentage of the standard, a fairly exact measure of the extent of the departure from the norm for that class of expense. In other words, we can thus obtain a coefficient of deviation from the standard for each kind of expense. These coefficients for any city, taken all together, reveal the extent to which that city is out of balance with the group standard.[1] Those for Brookline are given in the following table as an illustration.

A Comparison of the Distribution of Expenses of Elementary Schools in Brookline with the Distribution in fifteen Selected Cities

	Standard Distribution	Brookline Distribution	Coefficients of — Deviation — Above	Below
Supervisors	2.7	1.6	....	−40
Principals	7.8	10.6	+36	
Teachers	62.4	56.6	....	−09
Textbooks	1.8	1.8	+29	
Stationery	2.9	3.2	+10	
Janitors	7	8.6	+23	
Heat, light and janitors' supplies	5.8	7.1	+22	
Maintenance (repairs)	6	7.1	+18	
Libraries	.1			
Health	.9	1.2	+26	
Transportation	1	1.2	+20	
Miscellaneous	1.2	1.4	+17	
Total	99.6	100.4		

[1] Quoted from the Brookline report.

Analysis of Costs — Secondary Schools

Average Cost per Pupil in fifteen Selected Cities for Years 1914–15 and 1915–16 of Various Classes of Expenses of Secondary Schools Arranged in Order of Their Amounts

(a) Salaries and Expenses of Supervisors

1.	Wellesley	$12.30[1]
2.	Milton	5.55[1]
3.	White Plains	5.51
4.	Montclair	4.68
5.	Brookline	3.54
6.	Yonkers	3.20
7.	New Rochelle	2.36
8.	Madison	1.98
9.	San Diego	1.33
10.	Newton	.83
11.	Pasadena	
12.	Colorado Springs	
13.	Springfield	
14.	East Orange	
15.	Berkeley	
	Boston	1.13
	Los Angeles	

(b) Salaries and Expenses of Principals

1.	Brookline	$10.19
2.	New Rochelle	5.97
3.	Newton	5.87
4.	Springfield	5.77
5.	Pasadena	4.42
6.	East Orange	4.32
7.	Madison	3.84
8.	Berkeley	3.70
9.	Yonkers	3.65
10.	San Diego	3.47
11.	Colorado Springs	3.20
12.	White Plains	2.57
13.	Milton	[2]
14.	Wellesley	[2]
15.	Montclair	[2]
	Boston	4.50
	Los Angeles	8.46

(c) Salaries of Teachers

1.	Pasadena	$94.82
2.	San Diego	83.24
3.	Brookline	78.60
4.	Montclair	73.16
5.	Berkeley	72.79
6.	Springfield	70.10
7.	East Orange	64.95
8.	New Rochelle	57.41
9.	Yonkers	54.92
10.	Newton	53.42
11.	White Plains	52.68
12.	Colorado Springs	50.58

(d) Textbooks

1.	White Plains	$4.37
2.	New Rochelle	2.93
3.	East Orange	2.68
4.	Wellesley	2.61
5.	Yonkers	2.60
6.	Brookline	2.55
7.	Springfield	2.53
8.	Montclair	2.42
9.	Colorado Springs	1.61
10.	Newton	1.38
11.	Milton	.82
12.	Madison	.12

[1] Supervisors' and principals' salaries and expenses combined. [2] See (1).

(c) (*Continued*)

13. Wellesley	49.92
14. Madison	44.30
15. Milton	36.51
Boston	62.22
Los Angeles	115.18

(d) (*Continued*)

13. Pasadena	
14. Berkeley	
15. San Diego	
Boston	3.22
Los Angeles	

(e)
STATIONERY, SUPPLIES AND OTHER EXPENSES OF INSTRUCTION

1. San Diego	$8.67
2. East Orange	7.82
3. White Plains	7.49
4. Wellesley	7.30
5. Pasadena	7.09
6. Springfield	7
7. Brookline	6.61
8. New Rochelle	6.23
9. Montclair	4.86
10. Colorado Springs	4.82
11. Milton	4.61
12. Newton	3.63
13. Madison	3.44
14. Berkeley	3.30
15. Yonkers	2.48
Boston	3.61
Los Angeles	7.23

(f)
WAGES OF JANITORS

1. San Diego	$8.67
2. East Orange	7.82
3. Brookline	7.76
4. White Plains	7.49
5. Wellesley	7.30
6. Pasadena	7.09
7. Springfield	7
8. New Rochelle	6.23
9. Montclair	4.86
10. Colorado Springs	4.82
11. Milton	4.61
12. Newton	3.63
13. Madison	3.44
14. Berkeley	3.30
15. Yonkers	2.48
Boston	3.61
Los Angeles	7.23

(g)
HEAT, LIGHT, WATER, POWER AND JANITORS' SUPPLIES

1. White Plains	$6.38
2. Wellesley	5.92
3. East Orange	5.68
4. Springfield	5.54
5. Madison	5.54
6. Montclair	4.75
7. Milton	4.40
8. Colorado Springs	4.35
9. New Rochelle	4.32
10. Pasadena	4.25

(h)
MAINTENANCE (REPAIRS AND REPLACEMENT)

1. San Diego	$15.03
2. Pasadena	13.20
3. Colorado Springs	6.69
4. Springfield	4.51
5. Berkeley	4.43
6. Newton	4.20
7. Yonkers	4.06
8. White Plains	3.83
9. New Rochelle	3.56
10. Milton	2.68

11. San Diego	3.64	11. East Orange	2.50
12. Brookline	3.18	12. Brookline	2.48
13. Newton	2.57	13. Madison	2.32
14. Yonkers	1.62	14. Wellesley	1.85
15. Berkeley	1.41	15. Montclair	.82
Boston	2.71	Boston	2.32
Los Angeles	3.27	Los Angeles	7.96

(i) Libraries		(j) Health	
1. Pasadena	$2.27	1. White Plains	$2.12
2. White Plains	2.19	2. Madison	.55
3. San Diego	1.74	3. Montclair	.52
4. Colorado Springs	1.20	4. Brookline	.49
5. East Orange	1.03	5. East Orange	.42
6. Berkeley	.92	6. Yonkers	.14
7. New Rochelle	.28	7. New Rochelle	.10
8. Montclair	.08	8. San Diego	.08
9. Yonkers	.06	9. Wellesley	.03
10. Madison	.03	10. Springfield	
11. Wellesley	.03	11. Pasadena	
12. Springfield		12. Milton	
13. Milton		13. Newton	
14. Brookline		14. Colorado Springs	
15. Newton		15. Berkeley	
Boston		Boston	.01
Los Angeles	2.62	Los Angeles	1.58

(k) Miscellaneous

1. New Rochelle	$10.05	10. Montclair	$ .06
2. Pasadena	3.58	11. Springfield	
3. Madison	3.19	12. Newton	
4. Brookline	1.43	13. Yonkers	
5. San Diego	1.33	14. Milton	
6. Colorado Springs	1.30	15. White Plains	
7. Wellesley	.46		
8. East Orange	.41	Boston	1.46
9. Berkeley	.09	Los Angeles	4.42

PROPORTION OF TOTAL EXPENSES OF SECONDARY SCHOOLS IN FIFTEEN SELECTED CITIES EXPENDED FOR EACH CLASS OF EXPENSES IN THE YEARS 1914–15 AND 1915–16, ARRANGED IN ORDER OF THEIR AMOUNTS

(a)
SUPERVISORS' SALARIES AND EXPENSES

1.	Wellesley	14.4
2.	Milton	9.5
3.	White Plains	6
4.	Montclair	5
5.	Yonkers	4.2
6.	Brookline	3
7.	Madison	3
8.	New Rochelle	2.4
9.	San Diego	1.1
10.	Newton	1.1
11.	Pasadena	
12.	Springfield	
13.	East Orange	
14.	Berkeley	
15.	Colorado Springs	

(b)
PRINCIPALS' SALARIES AND EXPENSES

1.	Brookline	8.7
2.	Newton	7.9
3.	New Rochelle	6.1
4.	Madison	5.7
5.	Springfield	5.4
6.	Yonkers	4.8
7.	East Orange	4.6
8.	Colorado Springs	4.2
9.	Berkeley	4.1
10.	Pasadena	3.2
11.	San Diego	2.8
12.	White Plains	2.8
13.	Montclair	
14.	Wellesley	
15.	Milton	

(c)
TEACHERS' SALARIES

1.	Berkeley	80
2.	Montclair	78.1
3.	Yonkers	72.4
4.	Newton	71.8
5.	East Orange	69.5
6.	Colorado Springs	68.4
7.	Pasadena	67.8
8.	Brookline	67.2
9.	San Diego	67.1
10.	Madison	66.2
11.	Springfield	65.4
12.	Milton	62.2
13.	Wellesley	58.5
14.	New Rochelle	58.4
15.	White Plains	57

(d)
TEXTBOOKS

1.	Pasadena	5.4
2.	White Plains	4.7
3.	Yonkers	3.4
4.	Wellesley	3.1
5.	New Rochelle	3
6.	East Orange	2.9
7.	Montclair	2.6
8.	Springfield	2.4
9.	Brookline	2.2
10.	Colorado Springs	2.1
11.	Newton	1.9
12.	Milton	1.4
13.	Madison	.2
14.	San Diego	
15.	Berkeley	

(e)
STATIONERY AND INSTRUCTION SUPPLIES

1.	Springfield	8.4
2.	Milton	7
3.	White Plains	5.7
4.	Wellesley	5.7
5.	Brookline	5.6
6.	New Rochelle	5.3
7.	Berkeley	4.8
8.	Colorado Springs	4.2
9.	San Diego	4.1
10.	Wellesley	4
11.	East Orange	3.9
12.	Newton	3.3
13.	Montclair	2.5
14.	Madison	2.4
15.	Pasadena	.7

(f)
JANITORS' SALARIES

1.	Wellesley	8.6
2.	East Orange	8.4
3.	White Plains	8.1
4.	Milton	7.8
5.	San Diego	7
6.	Brookline	6.6
7.	Springfield	6.5
8.	New Rochelle	6.3
9.	Colorado Springs	6.3
10.	Montclair	5.2
11.	Madison	5.1
12.	Newton	4.9
13.	Berkeley	3.6
14.	Yonkers	3.3
15.	Pasadena	2.4

(g)
HEAT, LIGHT, WATER, POWER AND JANITORS' SUPPLIES

1.	Madison	8.3
2.	Milton	7.5
3.	White Plains	6.9
4.	Wellesley	6.9
5.	East Orange	6.1
6.	Colorado Springs	5.7
7.	Springfield	5.2
8.	Montclair	5.1
9.	New Rochelle	4.4
10.	Newton	3.5
11.	Pasadena	3
12.	San Diego	2.9
13.	Brookline	2.7
14.	Yonkers	2.1
15.	Berkeley	1.6

(h)
MAINTENANCE (REPAIRS AND REPLACEMENT)

1.	San Diego	12.1
2.	Pasadena	9.4
3.	Colorado Springs	8.7
4.	Newton	5.7
5.	Yonkers	5.4
6.	Berkeley	4.9
7.	Milton	4.6
8.	Springfield	4.2
9.	White Plains	4.2
10.	New Rochelle	3.6
11.	Madison	3.5
12.	East Orange	2.7
13.	Wellesley	2.2
14.	Brookline	2.1
15.	Montclair	.9

(i)
LIBRARIES

1.	White Plains	2.4
2.	Pasadena	1.6
3.	Colorado Springs	1.6
4.	San Diego	1.4
5.	East Orange	1.1

(j)
HEALTH

1.	White Plains	2.3
2.	Madison	.8
3.	San Diego	.7
4.	Montclair	.6
5.	East Orange	.4

(*i*) (*Continued*)

6. Berkeley	1
7. New Rochelle	.3
8. Montclair	.1
9. Yonkers	.1
10. Wellesley	
11. Madison	
12. Springfield	
13. Newton	
14. Brookline	
15. Milton	

(*j*) (*Continued*)

6. Brookline	.4
7. Yonkers	.2
8. New Rochelle	.1
9. Wellesley	
10. Springfield	
11. Pasadena	
12. Berkeley	
13. Colorado Springs	
14. Newton	
15. Milton	

(*k*)
TRANSPORTATION

1. San Diego	1.6
2. Pasadena	
3. Brookline	
4. Springfield	
5. New Rochelle	
6. Montclair	
7. East Orange	
8. White Plains	
9. Berkeley	
10. Yonkers	
11. Wellesley	
12. Colorado Springs	
13. Newton	
14. Madison	
15. Milton	

(*l*)
MISCELLANEOUS

1. New Rochelle	10.2
2. Madison	4.8
3. Pasadena	2.6
4. Colorado Springs	1.7
5. Brookline	1.2
6. San Diego	1.1
7. Wellesley	.5
8. East Orange	.4
9. Montclair	.1
10. Berkeley	.1
11. Springfield	
12. White Plains	
13. Yonkers	
14. Newton	
15. Milton	

The reports of the Bureau of Education at Washington give authoritative information on many school questions although, as a rule, they are not so recent as to furnish a satisfactory basis of procedure. The following figures on the cost of free textbooks and stationery and supplies are taken from the reports of school superintendents for the school year 1911–1912 and included in Bulletin Number 36 issued by the Bureau in 1915.

COST PER PUPIL FOR TEXTBOOKS IN VARIOUS CITIES OF THE UNITED STATES

Size of City	Elementary Schools		High Schools	
	Median	Average	Median	Average
Over 100,000	$0.74	$0.78	$2.61	$3.11
25,000–100,000	.72	.75	2.46	2.61
10,000–25,000	.80	.87	1.78	1.91
5,000–10,000	.84	.96	2.40	2.38

COST PER PUPIL FOR STATIONERY AND SUPPLIES USED IN INSTRUCTION IN VARIOUS CITIES OF THE UNITED STATES

Size of City	Elementary Schools		High Schools	
	Median	Average	Median	Average
Over 100,000	$0.78	$0.83	$2.79	$2.92
25,000–100,000	.79	.82	1.88	2.32
10,000–25,000	.79	.91	1.61	1.68
5,000–10,000	1.14	1.15	2.25	2.52

AVERAGE ANNUAL COST PER PUPIL TEXTBOOKS AND SUPPLIES FROM 1908–1915, FOURTEEN PENNSYLVANIA DISTRICTS, ALL GRADES

City	Average Cost of Textbooks Based on Average Attendance	Average Cost of Supplies Based on Average Attendance
Allentown	$0.83	$0.65
Altoona	.72	.73
Chester	1.15	1.65
Erie	1.06	1.02
Harrisburg	1.25	2.14
Johnstown	1.03	1.32
Lancaster	1.08	.77
McKeesport	1.00	1.44
Newcastle	1.05	1.33
Reading	.80	.78
Scranton	.96	1.16
Williamsport	1.13	1.20
Wilkes-Barre	1.00	.97
York	.92	1.35
Average fourteen cities	1.00	1.18

SPRINGFIELD, MASSACHUSETTS, COST PER PUPIL, AVERAGE ENROLLMENT, 1914

Schools	Teachers' Salaries	Books	Supplies and Equipment	General Expense and Miscellaneous	Total Cost per Pupil
Central High.....	$72.48	4.42	10.23	3.66	90.79
High School of Commerce.....	51.40	3.81	3.74	2.12	61.07
Technical High.....	76.07	1.84	6.60	3.36	87.87
Elementary.....	27.31	.89	2.03	2.09	32.32
Evening High.....	8.22	.78	.46	.78	10.24
Evening Elementary.	7.83	.36	.12	.44	8.75
Average for day schools.....	33.12	1.23	2.74	2.23	39.32
Average for evening schools.....	7.97	.51	.24	.56	9.28
Kindergarten.....	26.12	...	1.06	.11	27.29
Evening school trades.....	11.46	...	1.31	.68	13.45

COST OF MISCELLANEOUS ITEMS PER PUPIL PER YEAR

Item	Altoona, Pa. Basis Total Enrollment	Paterson, N.J. Basis Average Enrollment	Montclair, N.J. Basis Average Enrollment
General control.....	$1.28	$1.59	$1.21
Repairs.....	4.66	.42	3.40
Census.....	.05		
High School teachers' salary.....	38.09	39.47	74.25
High School principal.....	1.85	1.72	4.52
High School books.....	2.83	1.88	2.74
High School supplies.....	1.34	.64	5.30
High School janitors and firemen..	6.86	2.70	8.04
High School fuel.....	2.24	.88	2.50
High School light and power.....	.43	.82	4.70
High School janitors' supplies....	.21	.17	.42
High School medical inspection...	.03	...	.95
Elementary instruction.....	14.18	...	35.86
Elementary principals.....	1.96	8.87	4.50
Elementary special supervision...	.62	.07	5.66

COST OF MISCELLANEOUS ITEMS PER PUPIL PER YEAR (*Continued*)

Attendance	.22	...	.10
Elementary textbooks	.65	.54	1.01
Elementary supplies	1.37	.49	2.99
Elementary janitors	2.27	1.96	5.60
Elementary fuel	.54	.58	3.12
Elementary light and power	.35	.08	1.90
Elementary janitors' supplies	.22	...	.53
Elementary medical inspection	.10	.09	.88

The results of a detailed study of fuel costs in Montclair, N.J., for the different school buildings is given in the following table:

FUEL COSTS OF SCHOOLS OF MONTCLAIR, 1914–1915

School	No. 1000 Cu. Ft. Heated	Cost of Coal	Heating Cost per 1000 Cu. Ft.	Cost per Sitting	Cost per Capita Average Attendance
Cedar	286	653.50	2.29	1.80	1.98
Maple	...	763.31	...	1.98	2.26
Baldwin	538	846.03	1.60	1.85	2.23
Grove	650	888.00	1.40	2.11	2.72
Chestnut	...	542.84	...	1.93	2.62
Watchung	124	640.41	5.20	1.66	2.24
Mt. Hebron	524	1264.20	2.40	2.57	3.32
Heights	27	288.59	10.70	4.12	7.63
Hillside	2308	3162.84	1.38	3.22	4.51

Professor Bobbitt, of the University of Chicago, has worked out the cost of instruction in high schools in twenty-five cities in seven different states. The cost unit is the student hour, or, the instruction of one student for sixty minutes. The tabulation is given on the basis of one thousand student hours and shows the median cost and the middle 50 per cent, which may safely be considered the common practice.

COMPARATIVE COST OF HIGH SCHOOL SUBJECTS

Subject	Median	Middle 50%
Shop work	$93	$55–$131
Latin	71	54– 98
Commercial	69	51– 82
Modern languages	63	49– 82
History	62	49– 83
Domestic art	61	40– 80
Science	60	53– 86
Mathematics	59	47– 78
English	51	42– 70
Music	23	11– 46

The report of the Superintendent of Schools of Topeka, Kansas, gives similar information in a slightly different form.

RELATIVE COST OF INSTRUCTION BY DEPARTMENTS 1915

Subject	Enrollment	Instructional Cost	Cost per Pupil per Term	Cost per Pupil Hour	No. Recitations for $1
English	1194	$4209	$3.52	3.91 cts.	25.6
Mathematics	916	3725.50	4.08	4.54 "	22.1
Latin	552	2332.50	4.22	4.69 "	21.4
German	479	1814	3.72	4.14 "	24.2
History	818	3242.50	3.97	4.41 "	22.6
Science	578	5782.50	4.47	4.96 "	20.2
Household arts	396	1590.50	4.02	4.45 "	22.5
Business	592	2309.50	3.92	4.36 "	22.9
Normal training	115	480	4.18	4.65 "	21.5
Music	89	310	3.48	3.86 "	26.6
Freehand drawing	118	382	3.22	3.58 "	27.9
Mechanical drawing	211	870	4.13	4.60 "	21.7
Woodwork	137	765	5.58	6.21 "	16.2
Penmanship	148	240	1.62	1.79 "	55.8
Physical training	121	450	3.72	4.13 "	24.2

It is not easy to secure figures relative to school costs which are strictly comparable, because of the varied methods of accounting in different cities. Up to a few years ago, there were almost as many systems of bookkeeping and calculating costs in use as there were city school systems. About 1910, the United States Bureau of Census and the United States Bureau of Education agreed upon standard forms which have been adopted by many of our cities. As a result, much of the former confusion has been eliminated. Even when the same forms are in use, absolute uniformity does not exist. Rules cannot be made with sufficient definiteness to reduce human judgment to a common basis. Expenditures occur which may be charged legitimately to any one of several accounts. These variations, however, are minor and do not affect the broad general classifications.

CHAPTER XIII

PLANNING FOR FUTURE NEEDS

Too often school authorities, in planning and locating buildings to meet the ever-increasing demands for additional accommodations, do not formulate a policy based upon fundamental principles or continuity of action. They act upon vague impressions instead of making a systematic endeavor to learn the facts relative to present needs and probable future growth. The insistent demands of a group of selfishly interested parents may exercise an undue influence upon them, or the financial interests of certain citizens may weigh more heavily than the requirements of the school children. As a result of this lack of system, one district may show buildings crowded far beyond reasonable capacity or legal limits, while those in an adjacent section are only partially filled. Such a condition may be met by so fixing district limits that the required number of children are included within the specified boundaries, but this means of utilizing the half-empty buildings takes no account of the distance traveled by the children.

Even when their welfare is the sole basis for action, to determine the location and proper size of a new building is no simple problem. The most careful program may be disarranged by a sudden change in the direction of the city's growth, but, provided the fundamental plan is sound, a more rapid or a slower development than was

contemplated is not a serious matter. Its only effect is to hasten or delay the building scheme, for to carry out a program covering a long series of years compels a choice of sites with respect to future as well as to present needs. It is entirely conceivable that a building well placed for the first ten years of its life may be in such a location that it is but partially useful for the next forty or fifty years. It is a poor policy which sacrifices future needs to temporary expediency.

The modern business world furnishes models of forethought well worthy of imitation. Telephone officials, for example, locate their buildings and install the equipment only after making careful investigation not only of the number of probable patrons but also of the character and extent of the service likely to be needed.

This study represents an attempt to forecast the growth of Montclair, N.J., for a series of years in order to determine the most advantageous sites for schools and, in a general way, the size of the buildings necessary to care for an increasing school population. Such facts are modified to a certain extent by the character of the schools already in existence, and the proximity of Montclair to New York City brings about conditions of growth which would not be duplicated in every particular in communities removed from urban influence. The same principles, however, would be equally valid whatever the location of the community studied, since it is increasingly true that the population of towns near large cities is affected by the growing desire on the part of city dwellers to escape the congested conditions of city life. The rapidity of this growth depends to a large extent upon the quality of train service and the character of real

estate development. Low rents and large apartment houses tend to bring to a town a larger number of families than is the case when severe building restrictions and a predominance of one-family houses operate to increase rentals. Conditions in Montclair are such that only families of at least a moderate income can afford to pay the rents demanded.

In this study it is assumed that with a long continued pressure of population out from New York City through New Jersey, Montclair, with its limited area, will become congested quite rapidly, and that the normal pressure will continually increase in strength. This limited area is a constraining condition on the future increase of population and is a governing factor in the population estimates. As the town becomes congested, the New York pressure will be felt in the towns beyond. It follows, then, that the population growth of New York must enter into the estimates of the growth of any town in this section of the country. The United States Census Reports show what the city growth has been in the past few decades.

GROWTH OF NEW YORK CITY IN POPULATION

	Population	Growth	Percentage Growth
1870	2,093,444		
		617,198	29.5
1880	2,710,642		
		880,663	32.5
1890	3,591,305		
		1,359,814	37.9
1900	4,951,119		
		1,984,909	40.1
1910	6,936,028		

The general direction of this growth is shown by an analysis of the above figures as given in the following table.

NEW YORK CITY AND SUBURBS TO 33-MILE LIMIT. — PERCENTAGE DISTRIBUTION OF POPULATION AND GROWTH

	Manhattan		Bronx, Westchester and Rockland		Long Island		Richmond		New Jersey	
	Total Pop. %	Growth %	Total Pop. %	Growth %	Total Pop. %	Growth %	Total Pop. %	Growth %	Total Pop. %	Growth %
1870.....	45		6.1		23.6		1.6		23.7	
		36.1		3.4		31.8		1		27.7
1880.....	42.9		5.5		25.5		1.4		24.7	
		31.4		8.6		31.4		1.4		27.2
1890.....	40.2		6.2		26.9		1.4		25.3	
		30.1		12.2		30		1.1		26.6
1900.....	37.3		7.9		27.8		1.4		25.6	
		24.2		17		31.6		1		26.2
1910.....	33.6		10.5		28.9		1.2		25.8	

For each decade since 1870 the New Jersey growth has maintained an almost uniform ratio in comparison with the total growth of the great city, and it may fairly be assumed that future conditions will not vary greatly from past records. New Jersey must certainly continue to obtain very large growths, with the development of the New York district.

The next step is to ascertain the distribution in the various counties adjacent to New York and affected by its growth.

GROWTH OF NEW JERSEY COUNTIES ADJACENT TO NEW YORK

	Bergen		Essex		Hudson		Passaic		Union	
	Total Pop. %	Growth %	Total Pop. %	Growth %	Total Pop. %	Growth %	Total Pop. %	Growth %	Total Pop. %	Growth %
1880.....	5.3		37.1		36.7		12.2		8.7	
		3		31.7		41.8		17.3		6.2
1890.....	4.6		35.6		38.2		13.6		8	
		8.4		33.1		35.7		15.9		6.9
1900.....	5.8		34.8		37.4		14.4		7.6	
		11.2		34.1		33.5		13.1		8.1
1910.....	7.4		34.6		36.3		13.9		7.8	

Here again the same constant ratio is manifest. Essex County, in which Montclair is located, has a percentage of the total increase expressed within the limits of 31.7 per cent and 34.1 per cent.

The population study is next narrowed to include a similar period for Montclair only. It is unfortunate that the figures for the 1915 population cannot be officially checked until the 1920 United States Census is taken. They are, however, reasonably correct since they are based upon an actual count of the families in three wards and are verified by the figures of the State Census for 1915.

MONTCLAIR POPULATION AND GROWTH

	Population	Growth	Per Cent Growth
1890	8,656		
		3097	35.8
1895	11,753		
		2209	18.8
1900	13,962		
		2408	17.2
1905	16,370		
		5180	31.6
1910	21,550		
		4181	19.4
1915	25,731		

On the basis of past growth in the entire district of New York, Essex County, and Montclair, an estimate is made of the future development in Montclair to 1940. This must be conservative or the town will find the building program in excess of its ability to pay the cost. The census figures show that of the total New York

district growth about 27 per cent is in New Jersey, and of this more than 30 per cent is in Essex County. Since 1890 the five-year periods show Montclair increases varying from 17 per cent to 35 per cent. After making a field study of conditions in the several wards and interpreting previous rates of development in terms of the results of this study, the following assumption seems reasonable.

MONTCLAIR ASSUMED POPULATION INCREASE TO 1940

	Population	Growth	Per Cent Growth
1915	25,731		
		4500	17.5
1920	30,231		
		5099	16.9
1925	35,330		
		5500	15.6
1930	40,830		
		5350	13.1
1935	46,180		
		4850	10.5
1940	51,030		

This population estimate was next distributed by wards, the number of families in typical blocks being actually counted and due consideration being given to the type of dwelling and the number of families expected to live in blocks made up of dwellings of this character.

WARD POPULATION AND NUMBER FAMILIES, 1940

	Ward I	Ward II	Ward III	Ward IV	Ward V	Total
Population	12,000	6,200	7,830	13,200	11,800	51,030
Families	2,550	1,350	1,590	2,750	2,460	10,700

SCHOOL ATTENDANCE — ALL AGES

City	Pop.	1900 School	Per Cent	Pop.	1910 School	Per Cent
Akron, Ohio	42,728	7,211	16.9	69,067	10,852	15.7
Auburn, N.Y	30,345	4,400	14.5	34,668	5,653	16.3.
Binghamton, N.Y.	39,647	6,246	15.7	48,443	7,991	16.5
Canton, Ohio	30,667	5,593	18.2	50,217	7,674	15.3
Chester, Pa.	33,988	5,564	16.4	38,537	5,979	15.5
Davenport, Ia.	35,254	6,442	18.3	43,028	7,530	17.5
Elizabeth, N.J.	52,130	8,625	16.5	73,409	12,774	17.4
Evansville, Ind.	59,007	9,757	16.5	69,647	10,923	15.7
Ft. Wayne, Ind.	45,115	8,356	18.5	63,933	11,040	17.3
Hartford, Conn.	79,850	13,063	16.4	98,915	18,951	19.2
Knoxville, Tenn.	32,637	5,200	15.9	36,346	5,936	16.3
Lincoln, Neb.	40,169	9,440	23.5	43,973	8,759	19.9
Montgomery, Ala.	30,346	4,241	14	38,136	5,473	14.4
New Haven, Conn.	108,027	19,285	17.8	133,605	26,370	19.7
Portland, Me.	50,145	8,155	16.3	58,571	10,375	17.7

RELATION SCHOOL POPULATION 6 TO 14 YEARS TO TOTAL POPULATION, 1910

City	Total Population	School Population 6 to 14 years	Per Cent
Akron, Ohio	69,067	8,383	12.1
Auburn, N.Y	34,668	3,813	11
Binghamton, N.Y.	48,443	5,741	11.8
Canton, Ohio	50,217	6,035	12
Chester, Pa.	38,537	4,954	12.8
Davenport, Ia.	43,028	5,942	13.8
Elizabeth, N.J.	73,409	10,597	14.4
Evansville, Ind.	69,647	9,167	13.2
Ft. Wayne, Ind.	63,933	8,915	13.9
Hartford, Conn.	98,915	13,957	14
Knoxville, Tenn.	36,346	4,259	11.7
Lincoln, Neb.	43,973	5,531	12.6
Montgomery, Ala.	38,136	4,090	10.7
New Haven, Conn.	133,605	20,466	15.3
Portland, Me.	58,571	7,271	12.3
			14.5
Average			

Two sets of statistics relating to the past and present number of pupils in Montclair are available. One is provided by the United States Census and the other is the official school statistics for the town.

The United States Census, which is, as a rule, carefully supervised and is reasonably accurate for such a town as Montclair, provides statistics for 1910 giving the distribution of population within the following age limits. Under 6 years, 6 to 9 years inclusive, 10 to 14 years inclusive, 15 to 17 years inclusive, and 18 to 20 years inclusive, and also the percentage of the population from each of these classes attending school.

Assuming that the 6 to 14 year class corresponds to the elementary and junior high school age limits, and that the class 15–20 years corresponds closely to the senior high school age limits, we have a basis for estimating the relationship between population and school attendance for the two groups.

The first of the two preceding tables of selected cities shows the relation at 1900 and at 1910 between total pupils of all ages and total population, and the second table shows the relation between total population and population from 6 to 14 years inclusive.

Corresponding statistics for Montclair are as follows:

MONTCLAIR, 1910

Population	21,550
Attending school, all ages	3,758
Percentage, all ages	17.4
Total population, 6 to 14	2,795
Percentage in school	13

These data would lead us to estimate that approximately 17.5 per cent of the total population are enrolled as pupils, and of this number 75 per cent are of the 6 to 14 years inclusive, and 25 per cent are of the ages over fourteen years.

The United States Census statistics are checked by the official records of the Montclair School Department, giving a similar relation between population and pupils.

Date	Population	Average No. Pupils	Per Cent Pupils to Pop.
1905	16,370	2600	15.9
1910	21,550	3350	15.6
1915	25,731	4000	15.6

RELATION BETWEEN ENROLLED PUPILS, GRADES KINDERGARTEN TO EIGHTH INCLUSIVE, AND TOTAL ENROLLED PUPILS

Date	Total Enrolled	Grades Kd. to 8th	Per Cent of Total
1905	3186	2801	88
1906	3259	2873	88.2
1907	3346	2942	87.9
1908	3582	3079	86
1909	3730	3172	85
1910	3812	3197	84
1911	3889	3243	83.4
1912	3905	3246	83.1
1913	4102	3386	82.5
1914	4277	3544	83
1915	4499	3758	83.6

It is clear that these two sets of statistics do not represent exactly the same thing. The United States Census

figures include pupils in attendance at private schools as well as in the public schools. The subdivisions into the two age groups, 6 to 14 years and 15 to 20 years do not correspond exactly to the elementary and secondary school. A relatively large discrepancy exists between the 15 to 20 year old group and the high school enrollment. In one case it is 25 per cent of the total number of pupils who were 17.5 per cent of the total population, and in the other case it is 15 per cent of the total pupils who were 16 per cent of the total population. The comparison of the 6 to 14 year old group with the kindergarten to eighth grade shows less discrepancy. In the first the pupils are 13 per cent of the total population, and in the latter 13.4 per cent. This variation might be different if in the first case pupils not over 14 years of age but beyond the eighth grade were deducted, and if in the other case kindergarten pupils under six years of age were added. If these two corrections balanced, the figures would in both cases approximate 13 per cent. In the town as a whole the increase in public school pupils would seem to have coincided closely with the increase in population.

There is one possible comparison arising from the fact that the Mount Hebron district includes nearly all of Ward I and has retained the same limits since 1910. The relation between the average enrollment of pupils, kindergarten to eighth grade, and population in this district has been as follows:

Date	Population	Pupils	Per Cent Pupils
1910.....	2582	441	17.1
1915.....	3261	491	15

Totals of 760 and 1150 were deducted from the 1910 and 1915 population figures for the portion of Ward I in another district.

The relation between population and pupils in May, 1915, in all five wards is as follows:

Ward	Population	Total Pupils	Per Cent Total Pupils Population
I	4,411	770	17.4
II	4,904	653	13.3
III	5,330	736	13.8
IV	6,156	855	13.9
V	4,930	1040	21.1
Totals	25,731	4054	15.7

The corresponding figures for kindergarten to eighth grade pupils are as follows:

Ward	Population	Pupils	Per Cent Pupils
I	4,411	579	13.1
II	4,904	526	10.7
III	5,330	616	11.6
IV	6,156	751	12.2
V	4,930	882	17.9
Totals	25,731	3354	13

From these statistics it is clear that the relation between the total population and pupils is quite definite and may be used with confidence in making a forecast for the future. Therefore it may be assumed that in 1940, with a population of 51,030, the average enrollment will be 16.5 per cent of this population, or approximately 8400 pupils.

Applied to wards we have the following distribution:

Ward	Pupils	Per Cent of Population
I	2160	18
II	870	14
III	1190	15.2
IV	1910	14.5
V	2270	19.2
Totals	8400	16.5

To determine the type of school necessary to care for future increases of pupils, it is next desirable to approximate the percentage subdivision of the total enrollment into the three principal groups of pupils in the system, *i.e.*, the kindergarten to the sixth grade, the junior high school (grades seven to nine), and the senior high school (grades ten to twelve).

The available figures in Montclair go back only as far as 1912, but the figures for the last four years are sufficiently uniform to warrant the supposition that the probable future division will follow the same tendency.

	Sept. 1912		Sept. 1913		Sept. 1914		Sept. 1915	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Kindergarten to VI.	2412	66.2	2445	65.4	2740	67.8	2857	66.9
VII, VIII, and IX..	745	20.5	791	21.2	803	19.9	866	20.2
X, XI, and XII....	484	13.3	500	13.4	497	12.3	552	12.9
Totals.....	3641		3736		4040		4275	

Based upon these statistics it is estimated that the future subdivisions will be as follows:

Kindergarten to Grade VI.....	66.5%
Junior High School.....	20.5
Senior High School.....	13

When these percentages are applied to previous estimates, the distribution by five year periods appears as in the table below.

Date	Population	Elementary	Junior High	Senior High
1920	30,231	3260	1005	635
1925	35,330	3810	1176	744
1930	40,830	4460	1370	870
1935	46,180	5050	1560	990
1940	51,030	5630	1732	1098

These totals are distributed by wards for 1940 as follows:

Ward	Total	Elementary	Junior High	Senior High
I	2160	1221	544	395
II	870	596	151	123
III	1190	778	267	145
IV	1910	1480	260	170
V	2270	1507	500	263
Totals	8400	5582	1722	1096

In forecasting the distribution of pupils by school districts, definite boundaries must be assumed. These should, in general, coincide closely with a theoretical line equi-distant from adjacent schools, although deviation is occasionally advisable in order to meet local sociological conditions and also to conform to the existing capacity of the school buildings. In a small city the distribution of high school pupils is not a material consideration, since, as a rule, pupils will come from the entire city to a single high school. Several districts are likely to be grouped to provide a sufficient number of pupils to

facilitate the administration of a junior high school, but the building plans for elementary schools must consider future growth as well as present enrollment, or small children will be compelled to walk unreasonable distances.

The following table shows the 1940 needs in each of the Montclair districts.

Districts	Families	Kd. to VI	Junior High
Mount Hebron	1,892	917	408
Watchung	1,042	527	233
Edgemont	944	479	204
Rand	540	476	54
Grove	1,183	573	221
Baldwin	716	403	41
Glenfield	1,298	740	70
Nishuane	1,128	536	206
Hillside	1,957	931	285
Totals	10,700	5582	1722

Reference to the map on page 42 will make clear the proposed plan of caring for this number of children. Mount Hebron will contain both the elementary and junior high groups, but Watchung, Edgemont, Rand, and Grove will send their junior high school pupils to a building located near the center of their combined districts. At present these pupils are accommodated in the senior high school building. Hillside cares for its own pupils as well as for those from Baldwin, Glenfield, and Nishuane. When its capacity has been reached, provision must be made for the southern section of the town by an addition to Nishuane, which will then become a combined elementary and junior school.

This building program, which for the sake of illustration has been applied to Montclair, shows how it is possible

to give due regard to future needs, and by this means to avoid the needless expense arising from incorrect location of schools and the serious difficulties that come from planning a structure to meet present demands without provision for future unavoidable additions.

CHAPTER XIV

STATISTICAL INTERPRETATION

To consider a survey completed with the tabulation of collected statistics is to fail entirely to grasp its real purpose; the only justification for undertaking it at all is the ultimate correction of the abuses and the strengthening of the weak places it reveals. To this end the second step is so to interpret the data as to gain the information necessary for formulating constructive policies. Following so logically on the first, this point seems hardly to need emphasizing, but it is scarcely possible to overstate the viciousness of the results produced by the all-too-common practice of drawing hasty conclusions from insufficient or inaccurate data. So long as school authorities accept casual estimates and opinions as valid evidence, so long will the public school follow in the traditional paths instead of blazing a trail leading to the truth.

For really effective presentation, the facts revealed by the local survey should be shown graphically, although it is permissible to leave them in the tabular form in which they first appear. The construction of a statistical table is presumably a simple matter, but, in reality, to have completed this phase of the work in a scientific manner is to have overcome more than half of the difficulty, and it is just this elation at having surmounted a genuine obstacle which has, until very recently, allowed statisticians to rest at this point, content to regard the table itself as the goal of their effort.

In beginning a tabulation, the first consideration is whether the data shall be grouped in one table or in several. The single table is compact and all data are brought into close proximity, thereby enabling the reader to note resemblances and differences easily; but often a very real drawback occurs in that, if the table is too large, great difficulty is experienced in following lines and columns. This may be partly obviated by skill in ruling and spacing. A typical illustration is found in the practice of wide spacing after every fifth or sixth line. This method of grouping is preferable to the practice of drawing horizontal lines, which militate against the attractive appearance of the table.

In the construction of tables the following suggestions may be helpful:

1. Decide exactly what each table is meant to show. It is generally advisable to make each a unit, although it is entirely permissible to introduce two dissimilar topics if a definite relation exists between them. Any attempt, for instance, to show in the same table as two distinct items the length of teacher service and the size of classes, is to suggest dissimilar ideas and consequently to weaken the effectiveness of the argument. On the other hand, if it is desired to trace the effect of class size upon cost of instruction, both items may well be included.

2. Decide whether the table shall show absolute values, percentages, or both. This decision depends upon what comparisons are to be made. For example, if large numbers are to be compared with small numbers, an effective method is to reduce both to number in a thousand. A comparison of the persistence of attendance in a small school system with the figures from an entire

state is very difficult unless such a device is employed. If, however, it is found necessary to use such methods, it is advisable to note the absolute values also, in order that other studies may be easily made from the same table.

3. The number of headings is important. The more minute the subdivisions the greater the accuracy and ease in interpretation; but multiplicity of headings prevents emphasis upon the main facts. When complicated tables are used, summary tables can often be employed to advantage. These may be reduced to some common basis — such as number in a thousand or million — which is easy to comprehend and remember.

4. The title of the table should be complete and self-explanatory. The reader is not likely to take the trouble to hunt up footnotes or turn pages to ascertain the meaning of the numbers presented. Tabulation is intended to make facts emphatic, and the more vividly they stand out from the page the more certainly they serve their purpose. A common error is to use a title of too narrow scope to cover all the data. Avoid a title that has a double meaning. In all headings indicate the unit employed. Nothing is more exasperating than to attempt to interpret a table and find it almost impossible to ascertain whether the numbers employed represent percentage or absolute numbers.

5. Roman numerals in many instances stand out more prominently than Arabic.

6. Follow some systematic arrangement of data, especially in a long table. As an example, let cost of high schools in a large number of cities be shown. The arrangement may be alphabetical, according to geographical location, to the relative cost, or to the population of

the cities given. A reader wishing to compare some particular city with those given in the table can easily insert the name and data in the proper relative position if he is familiar with the general scheme of construction. Printing the name of this city in capitals is a simple device for making it stand out prominently in the list.

7. It is necessary to make a rough trial draft of the projected table before entering any data. This gives proper spacing, width of columns, and effective arrangement. Place numbers to be compared in close proximity and preferably in a vertical column rather than in horizontal lines.

8. Rulings indicate relative importance of subdivisions. The principal groups should be separated by either double or heavy lines. Exceptional items may be marked with a star referring to a footnote, but too many exceptions destroy the value of the table.

9. Too much care can hardly be taken to make all items accurate. The discovery of a few errors throws suspicion upon the whole table; some regular system of checks is therefore necessary. Verify every item by comparing it with the original to eliminate errors in copying. A certain large publishing house finds it necessary to require that each subscription blank be checked by six clerks in order to avoid possible mistakes. Add first in a vertical and then in a horizontal direction and compare the summated totals. All percentages should be added to see that the total equals 100 per cent, save in those instances where only a part of the percentages is given. Averages should be multiplied by the number of items and the product compared with the total. Multiplications and divisions should be performed twice,

preferably by two persons working independently of each other. For one person simply to repeat the operation will not suffice, as any mistake tends to recur. Commercial houses have found this tendency so pronounced that they place little reliance upon the plan.

10. Most readers are too indolent to analyze tables for themselves, hence there should be a written analysis which indicates clearly the desired conclusions. This practice is advisable even when the statement is little more than a repetition of the facts shown in the table. The analysis should be entirely frank and point out any possible errors and limitations in the conclusions drawn.

11. Never assume that because the table seems perfectly clear to its maker it will be equally clear to the reader. The work devoted to the preparation of a table gives an understanding of its principles impossible to one who approaches it with no previous knowledge. This comprehension can be furnished only by the most definite explanations.

As has already been indicated, careful workers in the educational field are not content to rest their case upon the presentation of facts in tabular form. Experience has shown that without the help of an accompanying statement, incorrect conclusions are often drawn or that the difficulties of interpretation are so great as to prevent the casual reader from giving them the attention necessary to understand their meaning. This presentation of conclusions does not imply any coercive influence upon the mind of the reader. If the tables appear in full they are incontrovertible evidence of good faith, and they also furnish the facts upon which to base other investigations. The second function is of extreme importance.

Many a promising line of investigation has had to be abandoned because accurate, original data, safeguarded by careful interpretative statements on which to base the study, have been lacking. We may expect real progress in education only when students in this field can find ready for their use an abundance of facts, secured under normal conditions and properly tabulated.

In the interpretation of tables and in the formulation of conclusions, certain statistical terms of a technical nature have come into general use. Some of them seem so familiar as to present no difficulties; others less frequently employed have very technical meanings and would be misunderstood save by those who have specialized in statistical work. Lack of care in determining the significance of nomenclature is responsible for some of the mistaken conclusions occasionally encountered in current educational periodicals. This can be made clear by taking as a simple illustration the well known term "average." A conclusion respecting financial conditions in a given community based upon *average* wealth would be reasonably accurate provided the property were more or less evenly distributed, but if the community were made up of one millionaire and other inhabitants in dire poverty, while the average wealth might be the same as in the first instance, any conclusions based upon this average would be grossly inaccurate. In this case it is plain that some other basis of comparison than the *average* wealth of the two communities is necessary.

Experience has shown that the following list of terms constitutes the minimum number essential to an accurate interpretation of the various conditions which may be encountered:

1. Mean or Average.
2. Frequency.
3. Weighted Mean.
4. Median.
5. Mode.
6. Average Deviation.
7. Standard Deviation.
8. Index of Correlation.
9. Probable Error.
10. Quartile.
11. Middle 50 per cent.

1. *The Average.*

This is the term most commonly employed and is the one most readily understood by the man on the street. It is easily computed by taking the sum of the various magnitudes and dividing by their number. If five papers are marked respectively 5, 10, 60, 70, 80, the average is 45.

2. *Frequency.*

This is the term used to indicate the number of individuals or units in a given group. This may be illustrated by a table showing the number of children who attain varying scores in solving problems in arithmetic.

NUMBER PROBLEMS

Number solved.....	0	1	2	3	4	5	6	7	8	9	10	11	12
Frequency.....	1	1	3	6	13	14	19	14	12	5	4	2	1

In this table frequency varies from one to nineteen, *i.e.*, from one child solving no problems to nineteen solving six problems, and then decreases to one child solving twelve problems.

3. *Weighted Mean.*

The weighted mean which approximates the average is a simplification used when the number of cases involved is large and it is desirable to avoid the trouble of making a laborious computation. Suppose we have 500 sticks varying in length from 22 inches to 56 inches. It is quite a task to find the average of the lengths of those sticks. The problem is simplified by arranging them in groups with specified length limits and multiplying the length represented by each group by the number of sticks in that group. For example, we might arrange them in groups differing in length by two inches and determine the frequency of each. Assuming nine groups we might have the following table:

	Length of Sticks								
Length	22	24	26	28	30	32	34	36	38
Frequency	9	35	57	88	105	84	69	38	15

Bear in mind that this does not mean that we have, for instance, 57 sticks 26 inches long. It means that there are in this group 57 sticks varying in length from 25 to 27 inches, but since the differences in length within the group tend to balance one another, for purposes of computation all sticks in the group are assumed to be of the same length.

The weighted mean or average is found by dividing the sum of the products referred to above by the sum of the frequencies (500). In the above example the weighted mean is 30.2 inches. Obviously the narrower the limits of each group the more nearly will the weighted mean be to the true average.

4. *Median.*

The simplest case of a median value is that of the middlemost measure in an odd number of measures arranged in order of size. For example, the ages of a certain group of five persons are 8–11–14–16–20 years, and the median age is 14 years. In practice the method usually followed is to arrange the measures in order of size and select the middlemost term. If the number of measures in the series is even, the median must be interpolated between the two middle terms.

In the series 5, 10, 60, 70, 80, the median is 60, since two measures lie below this measure and two above. Two distinct advantages appear in the use of the median: (1) Its simplicity; in a short series there is no necessity for arranging the measures in order, since the median may be determined by inspection, thus avoiding all computations. (2) It avoids a conclusion unduly affected by excessively small measures or by those that are excessively high.

At times the average and the median coincide, but in other instances they differ radically. In the series given above, the median is 60 but the average is 45, due to the effect of the small measures 5 and 10. If the series should read 5, 10, 50, 60, 70, 80, the median would fall between 50 and 60 with three terms above and three below the median point.

In a simple series, when the sum of the frequencies n is odd, the *number* of the median term is ascertained by the use of the formula $\frac{n+1}{2}$. When the sum of the series is even, it is between the two terms located by counting in $\frac{n}{2}$ terms from either extremity.

For a more detailed discussion, see Rugg's *Statistical Methods Applied to Education*, pp. 109–114.

When the frequency of each term is one, the median is readily ascertained by simply counting in the requisite number of terms and noting the corresponding measure. When the frequencies are greater than unity, a careful computation is necessary. The simplest form of a table of this character is one in which the measures are separated by unity. This is illustrated by the results of an arithmetical test in which the number of problems solved by different groups of children is shown. In this case the problem is definitely solved or not solved, hence the measures are separated by unit intervals. Frequencies are grouped, making it impossible to determine by inspection the number of problems solved by the middlemost child.

NUMBER OF PROBLEMS SOLVED AND FREQUENCIES

Number solved	0	1	2	3	4	5	6	7	8	9	10	11	Total
Frequency....	15	32	70	86	71	61	55	40	14	6	2	1	453

Since the number of children, or the sum of the frequencies, is 453, an odd number, the median term is found by using the $\frac{n+1}{2}$ formula; *i.e.*, the median term is found to be the 227th term. This is located in the group of 71 pupils able to solve four problems, since $15 + 32 + 70 + 86$ equals 203. Clearly then, the desired term lies 24 terms beyond the group of 86 children solving three problems. Strictly speaking, such a series as this is discrete, *i.e.*, progress is by intervals of one problem, but for the purpose of this computation it must be considered as continuous. If the table had related to

abilities of children in penmanship or English composition, it would have been strictly continuous, with abilities of children in a lower group shading off into the abilities of children in the higher group. Assuming the series to be continuous, it is evident that the 71 children are not at the exact point represented by four problems, but some are half way down toward the 86 group while others are half way up toward the 61 group. The child half way between the 86 and 71 group is the child able to solve 3.5 problems and the child half way between the 71 group and the 61 group is the child able to solve 4.5 problems. The space in the series covered by the 71 group is therefore, 1 (4.5−3.5). To find the problem ability of the 227th child it is necessary to add to 3.5, the lower limit of the 71 group, a value indicated by 24/71 of the space (one) included in the 71 group. This is approximately .3, which, added to 3.5, gives 3.8 as the required median or the achievement of the 227th child.

While the computation for the median in a series with unit intervals is comparatively simple, certain difficulties arise when the intervals are irregular, though the principle remains exactly the same.

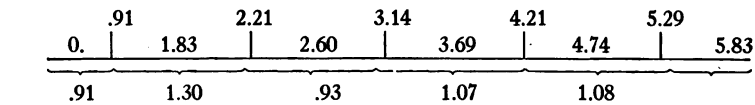
The following results from an application of the Hillegas Composition Test serve to illustrate the computation under more difficult conditions.

HILLEGAS STANDARD SCORE

Score	0	1.83	2.60	3.69	4.74	Total
Frequency	3	79	66	30	3	181

For the sake of clarity the mid-points between the successive scores as well as the limits of the distribution for each score are shown graphically.

In this drawing, the values .91, 2.21, etc., are the mid-points between the successive scores. The values



1.30, .93, 1.07, etc., indicate the spread of each group represented in the table. Turning now to the table, the desired term is $\frac{n+1}{2}$, or the 91st term. The sum of the first two frequencies is 82, and hence the median must be the attainment of the 9th child in the 66 group. To find the attainment of this child it is necessary to add to the lower value of the 66 group 9/66 of the value covered by this group, *i.e.*, 9/66 × .93 equals .13. Hence the median is 2.21 + .13 or 2.34.

5. *Mode.*

The mode is simply the measurement corresponding to the greatest frequency. In the discussion under weighted mean appears a table showing the arrangement of sticks in two-inch groups. The mode is 30, since here is found the largest number of sticks appearing in any group. In some instances such a measure as this is necessary to understand the facts. Suppose a church congregation of 100 contributed $1000 to some cause. The assumption that an average contribution of $10 was made would lead to the conclusion that all members contributed generously. A totally different conclusion would be reached if a distribution of the collection showed that one person gave $1000 while the remaining ninety-nine gave nothing. In this case the larger, or the modal, group contributed nothing. In an irregular

series two or more distinct modes may appear, or the distribution may be such that no distinct mode is apparent.

In a spelling test given to thirty-five children the following record was obtained:

Number of Pupils	Number of Errors
2	0
3	1
6	2
2	3
4	4
3	5
6	6
1	7
0	8
2	9
6	10 or more

Here are three distinct modal groups, viz., the six pupils making respectively two errors, six errors, and ten or more.

6. *Average Deviation.*

As the term implies, deviation indicates the amount by which the individual records depart from the average, median, or mode, as the case may be. Those below the average, median, or mode will be minus deviations, and those above will be plus deviations. The average deviation when the frequency is unity is determined by adding together both the plus and the minus deviations, regardless of sign, and dividing by the number of cases. This is expressed by the formula

$$A.D. = \frac{d_1 + d_2 + d_3 \ldots dn}{n}$$

When the frequencies are greater than unity each deviation is multiplied by its frequency and the sum is then found.

The table relating to length of sticks given in the discussion under weighted mean shows the following deviations from the mode which is thirty inches.

LENGTH OF STICKS

Length.....	22	24	26	28	30	32	34	36	38
Frequency.....	9	35	57	88	105	84	69	38	15
Deviation.....	−8	−6	−4	−2	0	+2	+4	+6	+8

The average deviation 3.16 + is found by multiplying these deviations by their respective frequencies and dividing the sum of the product 1478 by the number of sticks, which is 500. A similar procedure would be followed in finding the average deviation from the median, which in this case happens to be the same, or from the average.

As a practical illustration, the average deviation shown by a class in working examples in fundamental operations in arithmetic might be used. Evidently a class with a small average deviation is graded more closely than one with a greater average deviation. Determination of this value, then, furnishes direct evidence of the extent to which uniformity of ability in this particular phase of arithmetical work exists.

7. *Standard Deviation.*

This is a value commonly employed by statisticians, but the computation is longer and more tedious than that for average deviation. Derivation of the formula has no place in a discussion of this character, and its

validity is here assumed. To find the standard deviation when the frequency is unity, square the deviations, divide the sum of these squares by the number of cases, and take the square root of the quotient. The operation is expressed by the formula

$$S.D. = \sqrt{\frac{d_1^2 + d_2^2 + \ldots + d_n^2}{n}}$$

If the frequencies are different from unity and denoted by $f_1\ f_2\ f_3\ \ldots\ f_n$, then the formula becomes

$$S.D. = \sqrt{\frac{f_1\, d_1^2 + f_2\, d_2^2 + \ldots + f_n\, d_n^2}{f_1 + f_2 + \ldots\ldots + f_n}}$$

It is to be noticed that the standard deviation is concerned merely with the size and not with the sign of the deviation.

8. *Coefficient of Correlation.*

This is a term frequently employed in statistical discussions. It means that between two series or groups there exists some causal relation. The simple fact that two series vary together does not necessarily mean that correlation exists. Although the cotton crop of the South and the maple sugar crop of Vermont might increase in the same year, it is presumable that, owing to the different climatic conditions required, there is no causal relation between the two crops, and that the simultaneous increase is purely a matter of coincidence.

If, however, correlation does exist between any two groups, such as *a* and *b*, then whatever change occurs in *a* has some fixed relationship to the change in *b*.

Correlation is of two kinds: direct, when the two series vary in the same direction; inverse, when they

vary in opposite directions. If the price of grain and the price of milk both advance together, there is probably a *direct* correlation between the prices of the two. When there is a shortage of wheat the price rises as the supply diminishes: this is *inverse* correlation between supply and price. The correlation of a great variety of facts may be investigated; *e.g.*, the relation between the length and breadth of leaves, between tall fathers and the height of their sons; between ability in mathematics and ability in English; between knowledge of technical grammar and facility in the use of English. It is possible to show correlation by using a frequency graph, but this is unsatisfactory because it does not reveal the degree to which correlation exists.

To make clear the degree of correlation it becomes necessary to compute what is technically known as the coefficient of correlation. This is the numerical index of the relation between the *subject* and the *relative*, as the two variables are called. The subject is the variable selected as the standard, and the relative is the variable compared with it.

We shall see later that +1 means perfect direct correlation, 0 implies that no relationship exists between the two variables, and − 1 indicates perfect inverse correlation. Several methods of computing the index of correlation are employed, but the one devised by Karl Pearson is probably best known. The derivation of this formula is a problem in abstract mathematics, so complicated that it has no place in a discussion of this character. Students desiring an elaboration of the principles involved should consult such books as Karl Pearson's *The Grammar of Science*, King's *Elements of*

Statistical Method, Bowley's *Elements of Statistics* and Thorndike's *Introduction to the Theory of Mental and Social Measurements*. For the purposes of this book we take the formula for granted. Its application is not difficult, though the computations are somewhat tedious. The coefficient of correlation is given by the formula

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2} \cdot \sqrt{\Sigma y^2}}$$

when r equals coefficient of correlation,

x equals deviation from average in the first series,

y equals deviation from average in the second series,

Σ equals algebraic sum of the series.

To make clear the meaning of the various symbols we employ the illustration used by Dr. George Strayer.[1] He assumes a group of seven individuals with the following record of problems solved and words spelled correctly. In these problems the record in arithmetic is the subject and the spelling record is the variable.

Individuals	Number Problems Solved	Number Words Spelled Correctly
A	1	2
B	2	4
C	3	6
D	4	8
E	5	10
F	6	12
G	7	14

It is evident that as individuals increase in efficiency in one field there is a corresponding increase in the other. To find the coefficient of correlation construct the following table.

[1] Quoted by special permission from *How to Teach*, Strayer and Norsworthy. Copyright by The Macmillan Company.

Individuals	Arithmetic	X	X^2	Spelling	Y	Y^2	$X \cdot Y$
A.....	1	−3	9	2	−6	36	18
B.....	2	−2	4	4	−4	16	8
C.....	3	−1	1	6	−2	4	2
D.....	4	0	0	8	0	0	0
E.....	5	+1	1	10	+2	4	2
F.....	6	+2	4	12	+4	16	8
G.....	7	+3	9	14	+6	36	18
	7)28		28	7)56		112	56
	Av. = 4		$\Sigma x^2 = 28$	Av. = 8		$\Sigma y^2 = 112$	$\Sigma(x \cdot y) = +56$

$$\therefore r = \frac{\Sigma(x.y)}{(\sqrt{\Sigma x^2})\ (\sqrt{\Sigma y^2})} = \frac{56}{(\sqrt{28})\ (\sqrt{112})} = +1$$

The result + 1 shows perfect direct correlation.

The same illustration may be employed to show another type of correlation.

Individuals	Arithmetic	X	X^2	Spelling	Y	Y^2	$X \cdot Y$
A.....	1	−3	9	14	+6	36	−18
B.....	2	−2	4	12	+4	16	−8
C.....	3	−1	1	10	+2	4	−2
D.....	4	0	0	8	0	0	0
E.....	5	+1	1	6	−2	4	−2
F.....	6	+2	4	4	−4	16	−8
G.....	7	+3	9	2	−6	36	−18
	7)28		$\Sigma x^2 = 28$	7)56		$\Sigma y^2 = 112$	$\Sigma(x \cdot y) = -56$
	Av. = 4			Av. = 8			

$$\therefore r = \frac{\Sigma x.y}{(\sqrt{\Sigma x^2})\ (\sqrt{\Sigma y^2})} = \frac{-56}{(\sqrt{28})\ (\sqrt{112})} = \frac{-56}{56} = -1$$

The value −1 indicates perfect inverse correlation.

In the two illustrations cited above the facts determined by the use of the formulae were equally evident

by inspection. As a rule, however, the relationship is not so apparent. In the following table a computation is more necessary.

Individuals	Arithmetic	X	X^2	Spelling	Y	Y^2	$x \cdot y$ −	$x \cdot y$ +
A.....	2	−2	4	12	+4	16	−8	+6
B.....	1	−3	9	8	0	0	0	+4
C.....	4	0	0	2	−6	36	0	+4
D.....	5	+1	1	14	+6	36	−6	
E.....	3	−1	1	4	−4	16		
F.....	7	+3	9	6	−2	4		
G.....	6	+2	4	10	+2	4		
	7)28			7)56			−14	+14
	Av. = 4		$\Sigma x^2 = 28$	Av. = 8		$\Sigma y^2 = 112$	$\Sigma x \cdot y = 0$	

$$r = \frac{\Sigma x.y}{(\sqrt{\Sigma x^2})\ (\sqrt{\Sigma y^2})} = \frac{0}{(\sqrt{28})\ (\sqrt{112}} = 0$$

The resulting 0 shows that no correlation exists between the arithmetical ability of the group and the ability in spelling.

In the next type also, inspection does not reveal correlation.

Individuals	Arithmetic	X	X^2	Spelling	Y	Y^2	$x \cdot y$
A.....	1	−3	9	4	−4	16	+12
B.....	2	−2	4	2	−6	36	+12
C.....	3	−1	1	8	0	0	+0
D.....	4	0	0	6	−2	4	+0
E.....	5	+1	1	12	+4	16	+4
F.....	6	+2	4	10	+2	4	+4
G.....	7	+3	9	14	+6	36	+18
	7)28		$\Sigma x^2 = 28$	7)56		$\Sigma y^2 = 112$	$\Sigma x \cdot y = 50$
	Av. = 4			Av. = 8			

$$r = \frac{\Sigma x.y}{(\sqrt{\Sigma x^2})\ (\sqrt{\Sigma y^2})} = \frac{+50}{56} = +.89+$$

Since the relationship in the achievements of school children as shown by careful investigators varies from + .20 to + .60, the decimal .89 is highly significant. In general it may be assumed that any coefficient above + .50 warrants the conclusion that plus correlation exists to a significant degree, while a coefficient below + .15 or + .20 indicates a degree of correlation which is practically negligible.

RELATION OF AGES OF HUSBAND AND WIFE[1]

	Husband's Age	X	X^2	Wife's Age	Y	Y^2	$x \cdot y$
1....	22	−8	64	18	−8	64	+64
2....	24	−6	36	20	−6	36	+36
3....	26	−4	16	20	−6	36	+24
4....	26	−4	16	24	−2	4	+8
5....	27	−3	9	22	−4	16	+12
6....	27	−3	9	24	−2	4	+6
7....	28	−2	4	27	+1	1	−2
8....	28	−2	4	24	−2	4	+4
9....	29	−1	1	21	−5	25	+5
10...	30	0	0	25	−1	1	0
11...	30	0	0	29	+3	9	0
12...	30	0	0	32	+6	36	0
13...	31	+1	1	27	+1	1	+1
14...	32	+2	4	27	+1	1	+2
15...	33	+3	9	30	+4	16	+12
16...	34	+4	16	27	+1	1	+4
17...	35	+5	25	30	+4	16	+20
18...	35	+5	25	31	+5	25	+25
19...	36	+6	36	30	+4	16	+24
20...	37	+7	49	32	+6	36	+42
	Av. = 30		$\Sigma x^2 = 324$	Av. = 26		$\Sigma y^2 = 348$	$\Sigma x \cdot y = +291$

$$r = \frac{\Sigma x.y}{(\sqrt{\Sigma x^2})\ (\sqrt{\Sigma y^2})} = \frac{291}{(\sqrt{324})\ (\sqrt{348})} = +.86$$

[1] *Elements of Statistical Method*, Willford I. King, The Macmillan Company, New York.

When the two series are of considerable length and wholly lacking in regularity, the extent of correlation cannot be determined even approximately by inspection. This is illustrated by the preceding table.

One of the practical applications of correlation is its use in ascertaining the relative ability of pupils in two fields such as algebra and geometry.

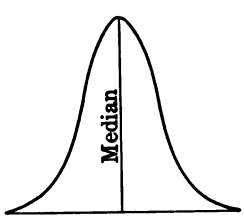
RELATION OF ABILITY IN ALGEBRA AND GEOMETRY[1]

	Geometry	X	X^2	Algebra	Y	Y^2	$x \cdot y$
1.....	80	+4	16	60	−14	196	−56
2.....	68	−8	64	73	−1	1	8
3.....	65	−11	121	80	+6	36	−66
4.....	96	+20	400	80	+6	36	120
5.....	59	−17	289	62	−12	144	204
6.....	75	−1	1	65	−9	81	9
7.....	90	+14	196	75	+1	1	14
8.....	86	+10	100	90	+16	256	160
9.....	52	−24	576	63	−11	121	264
10.....	70	−6	36	55	−19	361	114
11.....	63	−13	169	54	−20	400	260
12.....	85	+9	81	95	+21	441	189
13.....	93	+17	289	90	+16	256	272
14.....	87	+11	121	70	−4	16	−44
15.....	82	+6	36	68	−6	36	−36
16.....	79	+3	9	75	+1	1	3
17.....	78	+2	4	86	+12	144	24
18.....	79	+3	9	75	+1	1	3
19.....	82	+6	36	60	−14	196	−84
20.....	70	−6	36	82	+8	64	−48
21.....	52	−24	576	86	+12	144	−288
22.....	94	+18	324	85	+11	121	198
23.....	72	−4	16	73	−1	1	4
24.....	53	−23	529	62	−12	144	276
25.....	94	+18	324	85	+11	121	198
	25)1904		4358	25)1849		3319	1698
	76		Σx^2	74		Σy^2	$\Sigma x \cdot y$

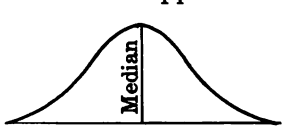
[1] *How to Teach*, Strayer and Norsworthy. The Macmillan Company.

9. *Probable error.*

The curve representing the distribution of frequency in a normal, *i.e.*, a symmetrical group, is known as a probability curve or curve of error. Since the average, or median, is the most probable value, any deviation from the average can be called and is in a sense an error. The probable error, therefore, is the limit on either side to the probable deviation from the average or median. Thus the probable error in a series is that deviation from the average or median on either side, within which exactly half of the items lie. In other words, it defines the limits of the middle fifty per cent and establishes the quartiles. It is expressed in terms of the units of value and shows how widely distributed a series of measures is. We might illustrate this further by saying that if we had the mean of the heights of eight year old boys, then the chances are exactly even that the height of any eight year old boy would not deviate further from the mean than the probable error, or P. E., as it is usually written.



The use of P. E. in statistics is to indicate the closeness of the grouping about the median. When P. E. is small, a grouping of the above type is indicated. When P. E. is relatively larger, a grouping more like the following results. An approximation to P. E., when the distribution is assumed to be normal, is obtained (1) by making an array of the items (2) by marking by t that item above which 25 per cent of the items lie, and by t' that item below which 25 per cent of the items lie.



Then P. E. $= \frac{1}{2}(t\text{–}t')$

P. E. may be expressed in terms of standard deviation by the equation —

P. E. $= .6745s$

where s represents the standard deviation.

The method employed in determining the decimal .6745 represents a problem in higher mathematics, and is here taken for granted.

10. *Quartile.*

The median has been defined as the middlemost term in a series. In a similar way the quartiles are the items dividing the series into fourths. The first quartile in a series with an odd number of terms is located by using the formula $\frac{n+1}{4}$: the third quartile is the $\frac{(3n+1)}{4}$ item. Whenever interpolation within a group is necessary, the method used for determining the median is employed.

11. *Middle Fifty Per Cent.*

This expression practically defines itself and is used to indicate the measures located between the first and fourth quartiles. It calls attention to the relative size of the group located about the median point.

This discussion of statistical terms is necessarily limited by lack of space, but those items have been included which are believed to be most essential in the interpretation of school conditions. For a discussion of details or further application of the principles involved, the reader is referred to other books dealing with the question at greater length.

CHAPTER XV

GRAPHICAL REPRESENTATION

THE collection of facts relative to the school system and their presentation in tabular form are, as we have already noted, only contributory to the real end of the survey. Tables of statistics must function in the creation of a strong public sentiment which shall make remedial measures possible, but the average citizen is too indifferent and too absorbed in his own private affairs to spend much effort in the interpretation of a mass of statistical material. The facts must be forced on his attention, and the more vivid and striking the presentation the better. Newspapers act on this principle by giving salient news items headline prominence, and in statistical work graphical representation serves the same purpose.

Many a man who would not take the trouble to read and interpret a column of figures showing the decrease in school retardation through a series of years will comprehend the change at a glance if, instead of reading figures, he is asked to look at the comparative lengths of the heavy black lines which represent them. When the comparative freight service in the United States for 1899 and 1911 was represented by the lengths of two freight trains, a definite impression was made upon even the most casual observer. If school superintendents show similar ingenuity in educating their constituents, there will be no lack of a well-informed public. It should be mentioned, however, by way of caution, that graphical

representation is often inadequate, and that the failure to understand some of its fundamental principles sometimes causes beginners, however well-intentioned, to give erroneous impressions to the reader.

A graph is of little practical use when it requires more time and effort to understand it than to obtain a similar idea from the tables themselves. Its sole purpose is to simplify the idea to be conveyed and thus make it easy of comprehension. Unless this can be done, it is far better not to attempt to use it. As a means of acquiring skill the study of the graphs employed by an expert is one of the best possible methods. A very clear presentation of this whole question is found in Willard C. Brinton's *Graphic Methods for Presenting Facts*, published by the Engineering Magazine Company of New York.

Graphical representation follows certain established principles which have been evolved from experience, but these rules are in the nature of general suggestions, allowing almost endless variations in the device employed. They are:

1. Select a title for the graph which cannot be misinterpreted.

2. Give the complete table on which the chart is based, so that table and chart may mutually reinforce each other.

3. Give a full description of the graph, using illustrations, if necessary, to make the meaning clear.

4. Assume complete ignorance on the part of the one who is to read the chart.

5. Do not depend upon the graph alone to make clear the desired comparison. Indicate on the chart the exact figures for compared areas or heights of columns.

6. The general arrangement of the chart should be from left to right.

7. The base, or zero, line should be heavier than the coördinates.

8. Horizontal scale figures should be placed at the bottom of the chart and repeated, if necessary, at the top.

9. In general it is assumed that all charts extend to the base, or zero, line. If space is lacking, a wavy line indicates that the field is broken off and does not reach zero.

10. In constructing charts for printing, use only enough coördinate lines to guide the eye in reading. Quarter-inch squares are small enough for the ordinary chart.

11. Charts involving time should have light lines at the left and right edges.

12. Avoid the use of areas and volumes to show quantities, since their relation to each other is that of the squares and cubes of their dimensions. Such charts are almost certain to be misinterpreted.

13. In making colored charts, green is employed to represent desirable qualities and red for undesirable qualities.

14. Squared paper with red and green lines is as readily photographed as paper lined with india ink. Ordinary ink will not show satisfactorily in a photograph.

Squared or cross-section paper laid off in millimeters is almost essential for graphs. It may be purchased of any supply house. Frequency curves plotted on cross-section paper have been used by engineers for many years to represent data relating to laws of physics, and

the same method of presenting facts has been utilized with equal success in other fields.

When the frequencies obtained in any investigation are tabulated, the existence of a definite law in their distribution is, as a rule, immediately apparent. A large number of leaves picked purely at random and arranged in order of their lengths will show that comparatively few are short or long, but that the majority are of intermediate length. It will further be observed that near the extremes the lengths change rapidly, while near the intermediate point the lengths are practically constant. The same general result will be found in the realm of pure chance. If three dice are thrown 387 times and the number of spots counted, the results will give a table similar to the following:

FREQUENCY TABLE SHOWING RESULTS OF THROWING DICE

No. of Spots	No. Times Occurring
4	2
5	4
6	12
7	30
8	36
9	44
10	56
11	68
12	40
13	38
14	28
15	14
16	7
17	5
18	3

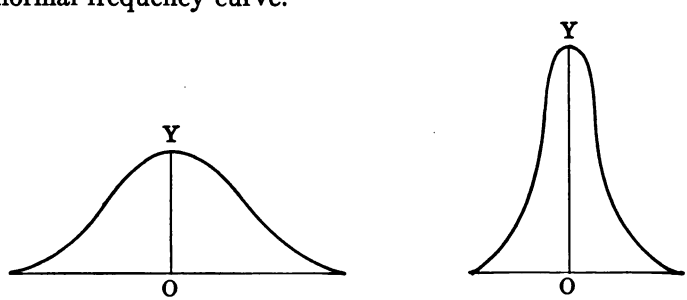
Dr. Whipple's test of rote memory span for digits gives a similar distribution when applied to 21 eighth grade pupils.

ROTE MEMORY SPAN FOR DIGITS

No. Digits Reproduced	No. Pupils
4	4
6	5
8	7
10	4
12	1

In this test the select character of the group accounts for a record with no pupils making a lower score.

Extensive studies of marks given by teachers show the same general tendency, and instances might be multiplied indefinitely to prove that in nature, in the field of chance, and in the mental world the large majority of items are grouped about the mode, while as the distance from the mode increases the items diminish rapidly. When tables of this type are plotted on cross-section paper the result is a bell-shaped form which is known as the probability curve, the curve of error, Gauss' Curve, and the normal frequency curve.



TYPICAL CURVES OF NORMAL DISTRIBUTION

Including a large number of separate items in the table makes it clearly impracticable to locate each item on the curve. This necessitates separating the data into classes with arbitrary dividing lines and treating each group as a whole.

Strictly speaking, the resultant graph of the usual frequency distribution is not a smooth curve, but rather a polygon. If a large number of items were measured, such as the heights of a group of boys, and the class intervals were made narrower and narrower, the steps would decrease in size and the polygon would gradually approach a true curve which is typical of the field as a whole.

In actual experience, a perfectly symmetrical curve is the exception, because at points of equal deviation above and below the mode, frequencies are unequal. Circumstances will determine whether the curve is skewed in one direction or the other. Supposing *A* to be the highest obtainable rank, the teacher of a class of a low order of ability may expect to find the curve representing the distribution of marks skewed to the right. If the class is one of superior ability, high marks should predominate, with a resultant skewing of the curve to the left. A perfectly symmetrical histogram represents the ideal, and any variation from this symmetry demands explanation of the particular condition.

The simplest form of graphical presentation is made by drawing two coördinate axes at right angles to each other. Upon the horizontal, or *X*, axis, mark convenient intervals corresponding to the units of measurement of the series to be plotted. Upon the vertical, or *Y*, axis, mark intervals corresponding to the frequency of the

series. Any point may then be located by giving its abscissa, or distance from the Y axis, and its ordinate, or distance from the X axis.

As an illustration of this method of plotting, assume the following percentage of non-promotion for eight grades of a school system.

Grade I.....	8 per cent	Grade V.....	19 per cent
" II.....	20 "	" VI.....	12 "
" III.....	12 "	" VII.....	11 "
" IV.....	6 "	" VIII.....	10 "

The table would be expressed graphically as follows:

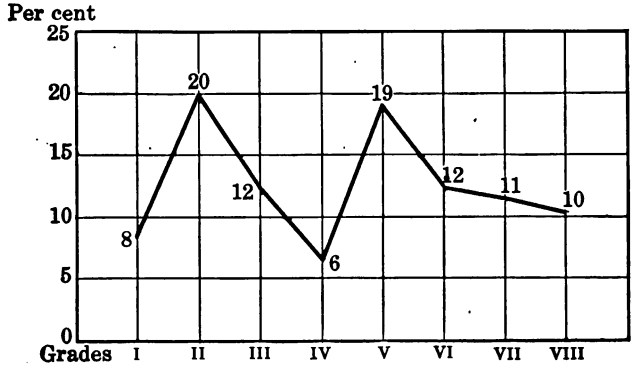


CHART OF NON-PROMOTION

A table giving the distribution of penmanship scores can be shown to advantage by employing the heights of columns. The measure appears on the X axis and the frequency is shown by column height.

A similar distribution for boys and girls separately may be shown on a single chart by using a white or a black column according to the sex.

It is sometimes desirable to express a number of different

DISTRIBUTION OF PENMANSHIP SCORES

No. Pupils	Quality of Handwriting
67	20
222	30
506	40
777	50
614	60
144	70
28	80
10	90

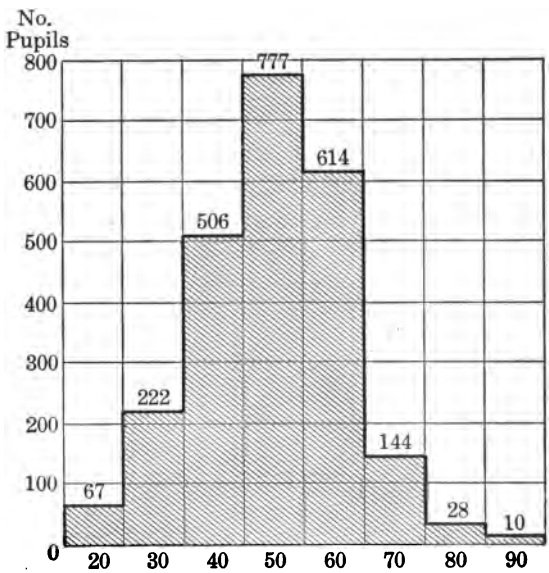


CHART OF PENMANSHIP SCORES

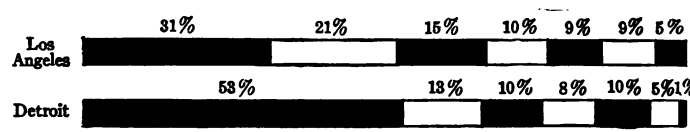
factors on a single chart, so that the varying elements of the table can be brought together and the resemblances and differences emphasized. This purpose is accomplished by utilizing vertical or horizontal bands in which similar facts are indicated by identical marking. As

an illustration of the principle, assume the percentage of population, in Los Angeles and Detroit, engaged in different industries as shown in the following table.

	Los Angeles	Detroit
Manufacturing	31 per cent	53 per cent
Trade	21 "	13 "
Personal service	15 "	10 "
Transportation	10 "	8 "
Clerical	9 "	10 "
Professional	9 "	5 "
All others	5 "	1 "
	100 per cent	100 per cent

The table offers a wide choice among the means for designating the various trades, such as alternate blocks of black and white, simple cross-hatching, double cross-hatching, etc. If only a single handmade chart is needed, color may be employed effectively. When this is done care should be taken to use colors which give a pleasing effect, since jarring colors detract from the value of the chart.

The following illustration shows the use of the alternate black and white segments:

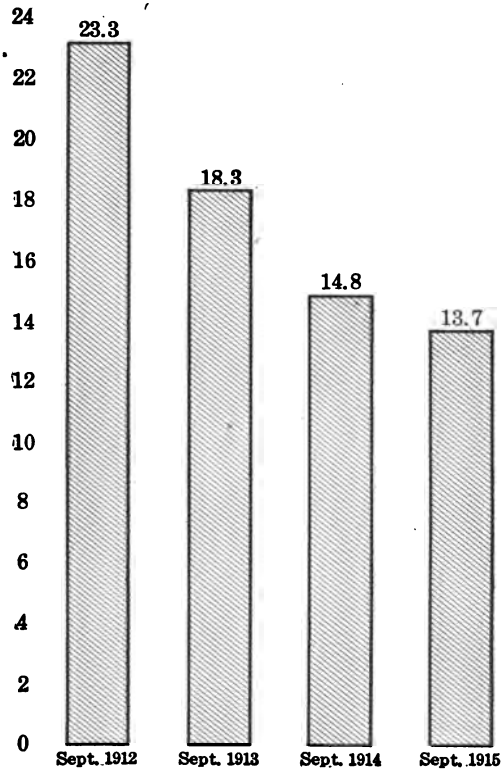


PERCENTAGE OF TOTAL POPULATION IN LOS ANGELES AND DETROIT ENGAGED IN DIFFERENT OCCUPATIONS

When the black spaces are large enough to permit it the figures which they represent may be written in the center of the space, a white area being left for this purpose. In any event the figures should always appear somewhere,

to enable the reader to interpret the chart easily and to compare the graph with the table.

In some instances the detached columns are a more effective method of representing facts for comparison.



PERCENTAGE OF RETARDATION IN CITY A FOR FOUR YEARS

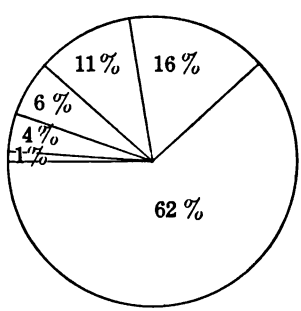
A change in the percentage of retardation for the school system is a case in point. In this chart the height of the column shows the percentage of retardation for the year indicated at the base.

Another scheme, which is always effective, is the use of the circle, in which the size of the sectors corresponds to the magnitude appearing in the table. A typical illustration is one giving the reasons why children leave school. The graph may be based either upon absolute figures or upon percentage.

WITHDRAWAL FROM SCHOOL

	Number	Percentage
Left City	1073	62
Work	270	16
Health	187	11
Remain at home	117	6
Enter Parochial School	68	4
All other reasons	35	1

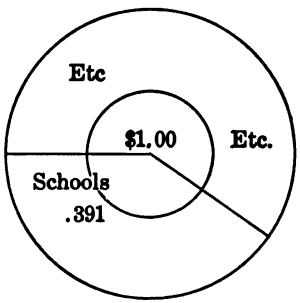
When the discussion involves the question of money, an added vividness results by using a dollar in place of the plain circle.



HOW THE CITY SPENDS ITS DOLLAR

Schools	.391
Recreation	.025
Libraries	.009
Streets	.082
Interest	.193

City government	.084
Police	.066
Fire	.052
Health	.083
Charity	.008
Miscellaneous	.007



Within recent years there has been a heavy increase in city taxes. Politicians have interested themselves in the public demand for water, sewers, paving, and other necessities of modern city life, and as a consequence the tax rate has mounted alarmingly. With the call for retrenchment the schools are the first to be endangered, since their political influence is far less than that of some other agencies, but the peril is more apparent than real, because at heart the American public is deeply concerned in the welfare of the children and needs only to be aroused to give adequate support to the school department.

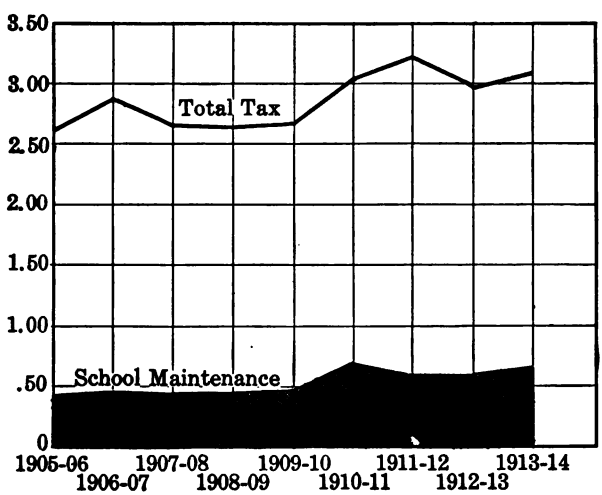
Incorrect conclusions can often be drawn from a study of the increase in school costs. The public is demanding more and more of its schools, and smaller classes, better accommodations, and experienced teachers with professional training are some of the reasons why school costs mount more rapidly than the increased enrollment seems to warrant. Only by comparing the increase in school

costs over a series of years with the increase in cost of other municipal departments can the real facts be shown.

COMPARISON OF TAX RATE FOR SCHOOLS IN ONE CITY WITH TOTAL TAX RATE

Year	School Tax	Total Tax
1905–06	.45	$2.76
1906–07	.48	2.88
1907–08	.45	2.69
1908–09	.45	2.63
1909–10	.48	2.70
1910–11	.74	3.06
1911–12	.58	3.26
1912–13	.58	2.97
1913–14	.69	3.08

This table expressed in graphic form shows whether an increasing tax rate may be attributed to large school



TAX RATE FOR SCHOOLS COMPARED WITH TOTAL TAX RATE

expenditures or whether the cause for this increase is to be sought in some other city department.

One of the serious problems in school administration is the overlapping of grades. An ideal grading scheme would place children of equal ability in the same group, but such an arrangement is practically impossible since no child is uniformly efficient in all the different subjects of the curriculum. The actual compromise policy in use determines the grouping of pupils by their ability in the majority of subjects. To ascertain in what subjects the individual child excels, it becomes necessary to study

RESULTS OF TEST FOR OVERLAPPING

Score	8th Grade	4th Grade
20	5	0
19	2	0
18	2	0
17	3	0
16	4	1
15	6	1
14	7	1
13	8	1
12	9	1
11	11	2
10	11	4
9	10	5
8	10	12
7	6	14
6	4	19
5	1	14
4	1	13
3	0	6
2	0	3
1	0	1
0	0	1

him critically, and as a preliminary step the school administrator must know the extent to which the trial

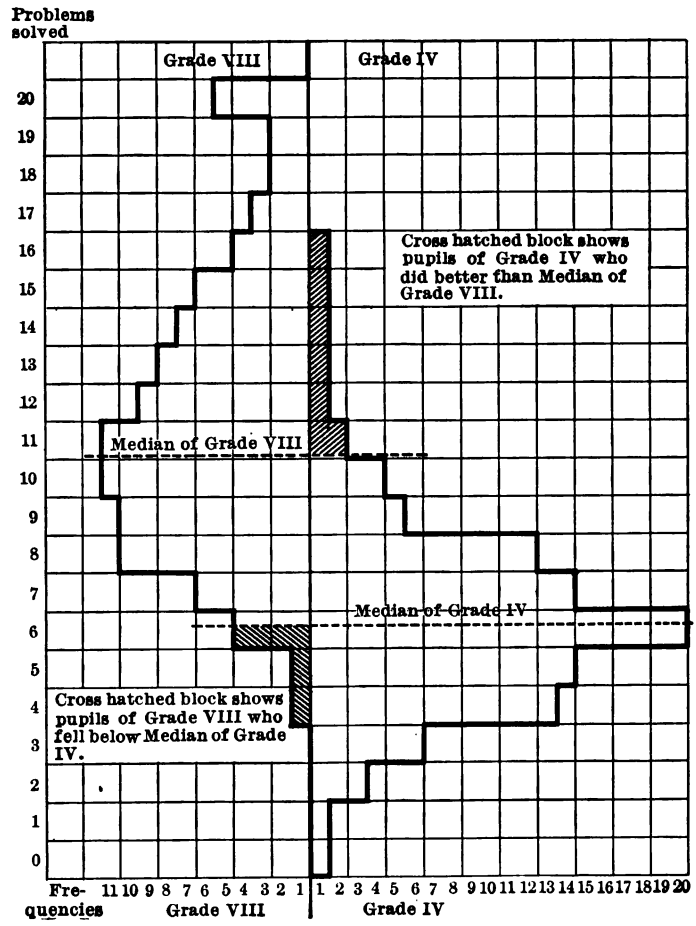


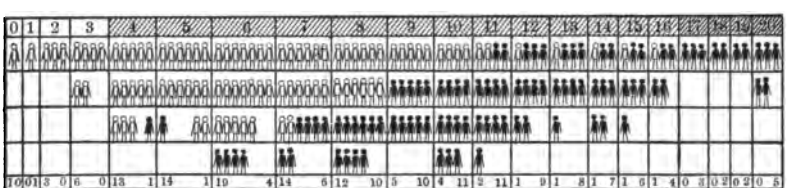
CHART SHOWING OVERLAPPING OF GRADES

Number of problems solved in same time by 100 pupils of Grades VIII and IV.

groups of pupils overlap. This overlapping of groups is far more excessive than is commonly supposed, as may be determined by a simple test. Assume the same number of problems given to 100 children in the 8th grade and to 100 children in the 4th grade. If the same length of time be allowed each group for the solution of the problems the characteristic results shown in the accompanying table and chart may be obtained.

The median attainment of grade VIII is approximately eleven problems, and of grade IV six problems. Clearly, then, so far as this single test is concerned, all pupils in the eighth grade whose record is lower than six problems show an arithmetical ability poorer than the ability of the fourth grade pupils who are above this median, and are more in need of instruction than the younger children. All pupils in the fourth grade whose attainment is above eleven problems are better than the eighth grade pupils falling below this median. The extent of this overlapping is much clearer when shown by a chart than a table.

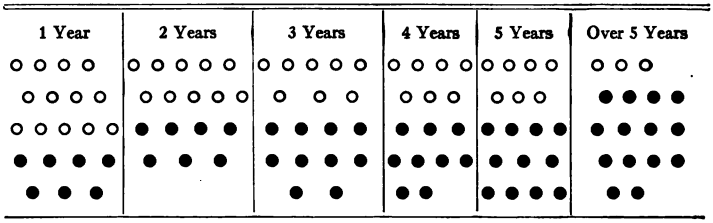
For some readers this overlapping is more apparent in a chart which represents actual pupils.



Ranges in which are found only IV grade children. Ranges in which are found only VIII grade children. Ranges in which are found children of both IV and VIII grades (overlapping). = IV grade child. = VIII grade child. Extent of overlapping shown by individual figures in each group.

A chart of the above type, showing actual pupils, is particularly effective in presenting this fact to an audience.

The color-spot chart appears less frequently than its value warrants. It is chiefly important as a medium for conveying a general impression of existing conditions. Let us suppose that it is desirable to represent the comparative length of service of teachers in two school systems. In making such a chart select a certain color, for example red, for one system, and another color, blue, for the second. Represent the number of teachers in each case by small circles of the selected color. The extent to which one color predominates over the other gives the desired impression. In the following representation white circles and black spots are used in place of colored surfaces.



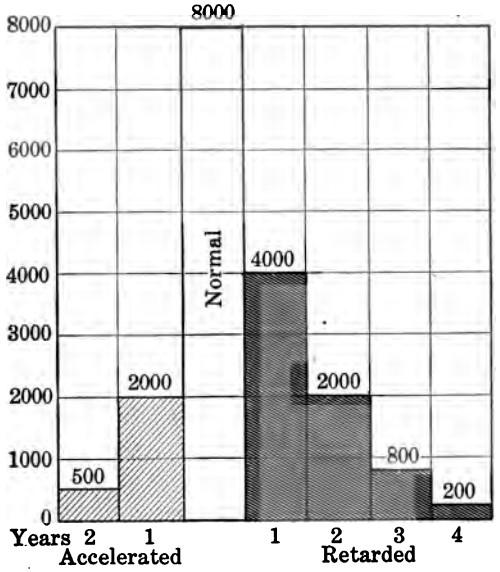
LENGTH OF SERVICE OF TEACHERS SYSTEM A AND B .

System A represented by white circle
System B represented by black spot

A variation of the color-spot chart appears in the use of a wall map with bead-headed pins of different colors to indicate the different facts. The number of pupils of each grade in a school district may be vividly shown in this way, the exact location of each child in the district being indicated by a pin at the spot where the house-number appears on the map. The combination of flexibility and permanency in such a scheme makes it a

valuable aid in the study of such changing problems as that of a shifting school population and the means of meeting the resultant variation in the demands on the school department.

In recent years studies of acceleration and retardation have occupied an increasingly important place in superintendents' reports. The totals for these studies are usually left in tabular form, and therefore they have usu-



RETARDATION AND ACCELERATION

Number pupils accelerated 2 years		500
" " " 1 year		2000
" " normal		8000
" " retarded 1 year		4000
" " " 2 years		2000
" " " 3 "		800
" " " 4 " or more		200

SCORES IN STONE REASONING TESTS[1]

Grade	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total	Median
V	15	32	70	86	71	61	55	40	14	6	2	1	..	..	..	..	..	..	453	3.7
VI	..	9	13	34	41	70	75	60	76	42	24	16	2	5	1	..	..	..	468	6.4
VII	1	0	2	10	18	36	40	47	45	50	37	35	23	29	16	13	3	5	409	8.6
VIII	..	..	2	3	8	18	14	18	28	27	25	31	16	33	13	21	9	15	284	10.5

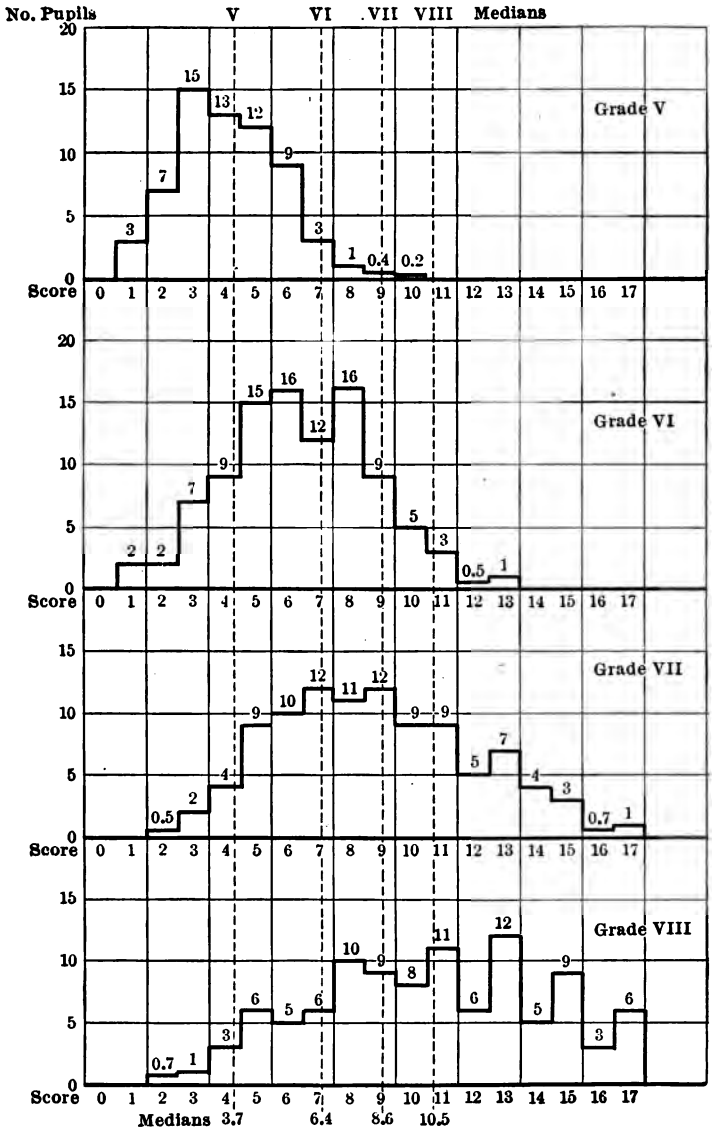
[1] Salt Lake City Survey Report

ally failed to impress the reader with their tremendous importance. Contrast the two methods of representation indicated on the pages 244 and 245.

In giving such tests as those that have been developed by Stone and by Courtis, it becomes important to show the medians for the different grades and the percentage of each class making the various scores.

In the chart on page 247 the columns show the percentage of pupils attaining the respective scores. For example, 15 of the 453 fifth grade pupils, or 3.3 per cent, made a score of zero; while 32 pupils, or 7 per cent, made a score of one. The vertical dotted lines show the median score for each of the grades. This type of chart is an excellent method of showing grade overlapping.

While the typical charts appearing in this chapter may prove suggestive to those attempting for the first time to utilize this form of expression, it is not assumed that they will fit all cases. Practically every situation demands a type of illustration adapted to it, and suc-



SCORES IN STONE REASONING TESTS SHOWN GRAPHICALLY

The height of the columns shows the percentage of pupils obtaining the indicated score. Medians are represented by dotted lines.

cess in finding one depends upon the originality of the person making the study. Much help is available in the published reports of various surveys, which present striking methods of conveying different classes of facts to the mind of the reader.

CHAPTER XVI

SURVEY OUTLINE

As a basis for the determination of the facts relative to any school system, the following list of questions and topics is suggested. They follow closely the material presented in the book, beginning with the second chapter which deals with the general conditions in the schools.

Chapter II. General Conditions

1. Map of city, locating transportation lines and school buildings. Are children compelled to travel an unreasonable distance?
2. Character of population, revealed by birthplace.
3. Relation between school population and total population, expressed in per cents.
4. Per cent of pupils within compulsory age limits actually in school.

Chapter III. Organization and Administration

1. Is the superintendent the actual as well as the nominal head of the school system?
2. Is the business department under the direction of an assistant superintendent?
3. Does the Board of Education leave details to the superintendent and devote its attention to broad questions of fundamental policy?

4. Does the organization of the school department locate responsibility definitely and secure an expeditious handling of details?

5. Size of Board of Education and manner of selection.

6. Is the authority for small expenditures vested in the executive officers and properly safeguarded?

7. Is unity of aim characteristic of the system?

Chapter IV. Supervisory and Teaching Staff

1. Is leadership of supervisors apparent?

2. Are supervisors free from clerical details?

3. Is a reasonable ratio between the number of supervisors and the number of pupils and teachers maintained?

4. What is the ratio between the number of men and women employed?

5. Character of training of supervisors, principals, and teachers.

6. What is the source of teacher supply?

7. Relation of the number of local teachers to all others.

8. Percentage of teachers of varying terms of service.

Chapter V. Salaries

1. Average and median salary in elementary and high school positions.

2. Variation in salaries of men and women.

3. Allowance in salary for different causes of absence.

4. Average salary for janitorial service.

5. Salary of teachers in comparison with the wage of other city employees.

6. Salary increment for increased efficiency.

Chapter VI. Pupils

1. Relation between census enumeration and school attendance.
2. Percentage of pupils of different ages in school attendance.
3. Distribution of pupils in different grades.
4. Percentage relation between each age and total enrollment.
5. Percentage of beginners completing grades VIII and XII.
6. Percentage of school attendance.
7. Distribution of attendance by days.
8. Age and grade and age and progress classification.
9. Degree of acceleration and retardation.
10. Causes of retardation.
11. Percentage of non-promotion.
12. Failure by grades and subjects in elementary schools.
13. Subject failure in high schools.
14. Size of classes in elementary and high school.
15. Size of classes in different high school subjects.
16. Number of weekly teaching periods in high school.

Chapter VII. Efficiency of Instruction

1. Character of tests employed.
2. Determine distribution of pupils in each grade according to quality of writing.
3. What is the median rating obtained in penmanship by grades?
4. Spelling attainment, by grades, Ayres Scale.

5. Spelling record, by grades, "One Hundred Demons."

6. Percentage correct, by grades, Buckingham Spelling Test.

7. Comparison of results with Courtis Arithmetic Tests, series A.

8. Comparison of median scores in arithmetic with Courtis Standards, series B.

9. Comparison of median arithmetic scores with standards in Stone reasoning tests.

10. Composition results compared with Rice standards.

11. Reproduction story for grades III and IV.

12. Application of Hillegas Scale standards in English.

13. Use of Harvard-Newton Scale in English composition.

14. Relative attainment with Kelly Reading test.

15. Check Kelly test by use of Starch's speed and comprehension test.

16. Verify conclusions with Courtis reading test.

Chapter VIII. Course of Study and Time Schedule

1. Are the fundamental aims indicated in the course of study in harmony with those generally accepted?

2. Percentage of total time, by grades, devoted to reading?

3. Is supplementary reading abundant and varied?

4. What is the source of words selected for spelling?

5. Amount of time devoted to the subject?

6. Time allowance for penmanship?

7. Proportion of total time devoted to composition and grammar?

8. Percentage of time devoted to history and geography?

9. To what extent is the problem method of teaching followed?

10. Amount of time devoted to industrial arts?

11. What are the provisions for adequate physical training?

12. What amount of home study is required?

Chapter IX. The School as a Social Center

1. What is the policy respecting the use of school buildings?

2. Number of centers opened in comparison with population?

3. Average attendance in evening schools and cost per pupil hour?

4. What is the number of evening sessions and percent of attendance?

5. What organizations utilize the building? For what purposes? Aggregate attendance?

6. What fees are imposed on such organizations?

7. Average attendance in summer school and per cent of attendance?

8. What organized social work is carried on during the school year in foreign sections of the city?

Chapter X. Buildings

1. Total score for each building in the city?

2. What particular features show low scores?

3. What is the building cost for each type of construction per classroom? Per pupil? Per cubic foot?

Chapter XI. School Hygiene

1. What percentage of the total enrollment show physical defects of various kinds?
2. What is the ratio of physicians, nurses, and dentists to enrollment?
3. What other specialists are employed?
4. What provisions are made for atypical children?
5. What is the cost per pupil for each group?
6. Do the school buildings conform to standard hygienic requirements?

Chapter XII. School Finance

1. What is the school expenditure per $1000 of wealth?
2. What is the real wealth behind each dollar spent for school maintenance?
3. What is the school tax in mills for school maintenance?
4. What is the population per capita cost for schools?
5. What is the cost for each 1 per cent of the children in the population?
6. What per cent of the total city maintenance cost is devoted to schools?
7. Distribution of the total city maintenance costs among the different departments.
8. Comparison of total city maintenance costs with expenditures for new buildings.
9. Distribution of annual school cost within the school department.

10. Distribution of school maintenance costs between elementary schools and high schools.
11. Expenditure per child for different departments within the school system.
12. Cost per pupil for books and supplies in the elementary schools and high schools.
13. Cost per pupil per annum, selected items.
14. Comparative cost of high school subjects.

Chapter XIII. Planning for the Future

1. Percentage growth of suburban district for series of years.
2. Distribution of growth in each section of suburban district.
3. Percentage growth of city through a series of years.
4. Assume rates of city growth for future in five year periods.
5. Distribute assumed population at selected date by wards. This is checked by actually counting building lots in typical blocks.
6. Relation between number of children 6–14 years and total population.
7. Relation between school population 6–14 years and total population through a series of years.
8. Relation between school enrollment and total population through a series of years.
9. Relation between enrolled pupils and population by wards.
10. Relation by wards between pupils and population at selected future date.

11. Percentage of pupils through series of past years in elementary schools and in high school.

12. Using assumed future population as the basis, apply derived percentages of total pupils and percentage distribution.

13. Assume districts according to relative distances to be traveled by pupils and distribute pupils accordingly.

14. Compare these totals with growth of school attendance in each district during past series of years.

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Books

Arithmetical Abilities, Some Factors Determining Them. C. W. Stone, Teachers College, New York City.

City School Expenditures. G. D. Strayer, Teachers College.

Educational Measurements. Daniel Starch. Macmillan.

Educational Tests and Measurements. Walter S. Munroe. Houghton Mifflin.

Elements of Statistical Method. W. I. King. Macmillan.

Elements of Statistics. Alfred L. Bowley. King, London.

Grammar of Science. Karl Pearson.

Graphic Methods for Presenting Facts. Willard C. Brinton. Engineering Magazine Co., New York City.

How to Teach. Strayer & Norsworthy. Macmillan.

Identification of the Misfit Child. Leonard P. Ayres, Russell Sage Foundation, New York.

Introduction to the Theory of Mental and Social Measurements. Edward L. Thorndike, Teachers College.

Laggards in Our Schools. Leonard P. Ayres, Russell Sage Foundation.

Manual of Mental and Physical Tests. G. M. Whipple. Warwick & York, Baltimore, Md.

One Hundred Spelling Demons of the English Language. J. W. Studebaker. Newson & Co.

Primer of Statistics. W. P. and E. M. Elderton. Adams and Charles Blade, London.

Public School Administration. E. P. Cubberley. Macmillan.

School Health Administration. L. W. Rapeer, Teachers College.

Scientific Management in Education. J. M. Rice, Publishers' Printing Co., New York City.

Spelling Vocabularies of Business and Personal Letters. Leonard P. Ayres, Russell Sage Foundation, New York.

Reports

Fourteenth Year Book of the National Society of Education. University of Chicago Press.

Fifteenth Year Book of the National Society of Education. University of Chicago Press.

Massachusetts State Department, 1916, Courses of Study.

Second Annual Conference on Educational Measurements. Indiana University, Bloomington, Ind.

Report of Bureau of Educational Measurements. State Normal School, Emporia, Kan.

United States Bureau of Education Reports.

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Scales

Arithmetic

S. A. Courtis, 82 Eliot St., Detroit, Mich.
Daniel Starch, University of Wisconsin.

Composition

Harvard-Newton Scale, Harvard University Press, Cambridge, Mass.
Myron B. Hillegas, Teachers College, New York.
S. A. Courtis, 82 Eliot St., Detroit, Mich.

Handwriting

Edward L. Thorndike, Teachers College, New York
Leonard P. Ayres, Russell Sage Foundation, New York
Daniel Starch, University of Wisconsin.
C. Truman Gray, University of Texas.

Reading

F. J. Kelly, Emporia, Kan.
E. L. Thorndike, Teachers College.
S. A. Courtis, 82 Eliot St., Detroit, Mich.
Daniel Starch, University of Wisconsin.
Wm. S. Gray, University of Chicago.

Score Card for City School Buildings

G. D. Strayer, Teachers College, New York.

Spelling

Leonard P. Ayres, Russell Sage Foundation, New York.

SURVEYS

Ashland, Ore. . . . . Fred C. Ayer and others.
Bridgeport, Conn. . . . . James H. Van Sickle and others.
Boston, Mass. . . . . James H. Van Sickle and others.
Brookline, Mass. . . . . James H. Van Sickle and others.
Buffalo, N. Y. . . . . New York State Department.
Butte, Montana . . . . . George D. Strayer and others.
Cleveland, Ohio . . . . . Leonard P. Ayres and others.
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Oakland, Cal. . . . . Ellwood P. Cubberley and others.
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